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DEPARTMENT OF THE INTERIOR

JOHN BARTON PAYNE, SECRETARY

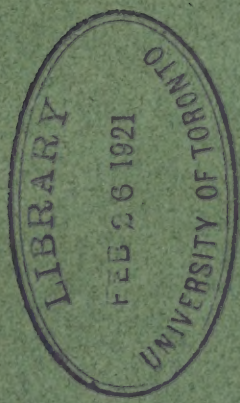
BUREAU OF MINES

FREDERICK G. COTTRELL, DIRECTOR

QUALITY OF GASOLINE MARKETING
IN THE UNITED STATES

BY

H. H. HILL and E. W. DEAN



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PREFACE.

Scarcely a lifetime has passed since the first oil well was drilled at Oil City, Pa., in 1869, but these years have witnessed the arrival of a new industrial era—the petroleum age. Two generations ago the question of an adequate supply of oil concerned no one. Oil was then hardly more than a curiosity. To-day the failure of our oil wells would be a national disaster, for petroleum in its several uses has become a basic necessity of our modern life, equal in importance to coal and iron. Gasoline alone has become one of our chief commercial assets, and likewise has entered to an irreplaceable extent into our recreations. Except for gasoline, the automobile—the motor truck—the airplane, would not be common sights to-day. Billions of dollars are invested in gasoline-using conveyances and hundreds of thousands of people derive a livelihood from their manufacture and use.

Although gasoline is one of the most familiar commodities of to-day, yet the public has meager information regarding it, and the intent of the Bureau of Mines in issuing this bulletin is to supply pertinent information on a commodity of basic importance. The purpose of the bulletin is chiefly educational, as it is believed that the first step in the demand for conservation must be a demonstration of the need of increased efficiency.

The diverging curves of percentage increase in the production of petroleum, gasoline, and automobiles presented on page 19 (fig. 6) tell a plain story. Can the demand, represented by the increase in the number of automobiles, be met by the supply, represented by gasoline and petroleum? Except for temporary shortages, our petroleum industry so far has always met this demand. But can it continue to do so in the future? Only recently has the automotive trade asked this question. The automotive industry has expanded enormously in recent years, but seems to have assumed without investigation that supplies of gasoline will always be obtainable when needed. Recently, however, the industry has become unpleasantly aware that motor fuel is a commodity beyond its own control and that the chief authority on this subject, the Interior Department, is concerned lest our oil fields fail us in the not far distant future. At the same time the automotive trade has become confused in the discussion of different factors governing supply, by seemingly irreconcilable statements emanating from various official and unofficial sources. As our future supply of gasoline has become a question of such concern, the views of the Bureau of Mines on the subject are set forth in this bulletin.

The United States Geological Survey during the last 10 years has made several estimates of the quantity of oil left in our oil fields. The most recent estimate, that of David White, indicates that about 40 per cent of the oil had been brought to the surface, and that the 60 per cent remaining underground, if recovery as needed were possible, would last barely 20 years at the present rate of consumption. As the period in which an oil field can be made to yield its oil is not wholly within the control of man, the domestic production will undoubtedly be spread over a much longer period than that estimated; but, on the other hand, the peak of production will be passed long before 20 years, and thereafter production will be at a declining rate. Of course, such estimates are by no means infallible, as many obscure factors are involved. However, this statement represents the opinion of the agency best qualified to make such an estimate, and is indicative of a condition which, were there no other solution to the problem, would be highly unsatisfactory, and would be viewed by the automotive industry with the greatest concern. For, even were the estimate unduly pessimistic and the actual reserve twice that shown, the condition would still be unsatisfactory.

The preceding statement refers only to the oil from oil wells in the United States. Fortunately, there are enormous undeveloped resources in the rest of the world. The petroleum resources of this country have been developed and depleted in a ratio far beyond that of other countries, so that although we are producing to-day two-thirds of the world's production, the opportunities elsewhere for increasing production are much greater than in the United States. Geologists and those well informed on foreign resources believe that in all probability the world contains enormous reserves of oil that can be obtained upon demand. Although to obtain oil from these reserves may not be as satisfactory as to obtain it within the confines of the United States, the outlook tends to assure the future of the internal-combustion engine.

Fortunately, oil may be obtained from other sources than oil fields. In various parts of the United States, particularly in Colorado, Wyoming, and Utah, are enormous bodies of oil shales from which oil may be obtained by destructive distillation as benzol is obtained from coal. The United States Geological Survey has estimated the quantity of oil locked up in the richer shales of the three States mentioned as perhaps ten times the amount of the oil reserve in the oil fields. In Scotland, the retorting of oil from oil shales has been on a commercial basis for more than 50 years, and antedates the oil industry in the United States. Commercial and semicommercial experiments are being made in order to determine whether the oil shales of the Western States can be mined and retorted profitably in competition with petroleum from oil fields. This problem has not

yet been solved, but these shales constitute a latent reserve that protects the future needs of the country for motor fuel, as far as these needs can be foreseen. However, oil can not be obtained from the shales on a large scale without heavy investments, and the development of the industry must be spread over many years. Also, when that time comes, the consumer will probably have to pay more for his gasoline.

As regards the question of substitutes, this bulletin indicates that if prices of petroleum products advance sufficiently, alcohol may become one of the motor fuels of the future. The efficient use of alcohol requires, however, certain modifications in the present design of the mobile internal-combustion motor. Moreover, large quantities of lubricants are required in addition to motor fuel. Hence, it seems desirable to continue to depend on crude oil as a principal source as long as possible, especially as crude oil is the only known satisfactory raw material yielding both motor fuel and lubricants.

Briefly, motor fuels may be obtained from four possible sources: (1) Petroleum from our own oil wells, (2) petroleum from wells in foreign countries, (3) oil from our oil shales, and (4) gasoline substitutes. As to the first, there is serious but not immediate concern; as to the second, it is believed that there remain enormous potential reserves outside of the United States; as to the third, there are known deposits of oil shales which, in three States alone, promise to yield many times more oil than will ever be recovered from our oil wells; as to the fourth, it is probable that eventually alcohol could meet our needs should gasoline fail. Thus, while there is concern over our own domestic supplies of petroleum from oil wells, there is no concern as to the ultimate supply. There may be critical periods when one source fails and before another has been sufficiently developed, also it is not unlikely that when our own wells fail and we have to fall back on oil from foreign countries or from oil shales, that we shall have to pay more for our motor fuel.

The obvious general conclusion is that users of internal-combustion engines should bear in mind the need of conserving supplies of petroleum-derived motor fuel by a more economical and efficient utilization of the quantity still available and by a willingness to employ substitutes wherever these are available and give reasonably satisfactory service. No one agency alone is capable of solving the problem of maintaining a permanent supply of motor fuel, but the consuming public can undoubtedly do more in this direction than either the producer of motor fuel or the manufacturer of automotive equipment, both of whom are almost absolutely controlled in their operations by the demands of the consumer.

J. O. LEWIS,
Chief Petroleum Technologist, Bureau of Mines.



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QUALITY OF GASOLINE MARKETING IN THE UNITED STATES.

By H. H. HILL and E. W. DEAN.

INTRODUCTION.

Gasoline has become of such commercial and military importance that it is now practically indispensable. This product is of special interest because, in addition to realizing its value, the Nation is learning that the raw materials from which gasoline is obtained are not unlimited.

ACTIVITIES OF THE BUREAU OF MINES IN PROMOTING EFFICIENCY IN THE PRODUCTION AND UTILIZATION OF GASOLINE.

The Bureau of Mines has directly and indirectly worked for the conservation and efficient utilization of this important product. Some of the bureau's activities have been along lines widely different from those reported in this bulletin. The work of the bureau toward the increase in efficiency of processes for the production and refining of crude oil is too well known to need mention here. Another line of activity in which the bureau has engaged is the collection and publication of statistics on refinery operations. Finally, as immediate preparation for the present bulletin, two surveys of the gasoline marketing situation have been made. The primary object of this bulletin is to make available to the public information obtained in connection with these surveys.

PURPOSE OF THE GASOLINE SURVEYS OF 1917 AND 1919.

Shortly after the United States declared war on Germany the bureau collected gasoline samples in the retail market throughout various parts of the country. Information regarding the sources of these gasolines and the details of marketing them was obtained, and they were subjected to analytical tests which furnished conclusive information regarding their properties. The information obtained through this survey proved of inestimable value both to the bureau and the United States Fuel Administration, particularly in drawing up specifications and in ascertaining the best means of obtaining supplies of particular types of gasoline that were needed.

A similar and more extensive survey was made in the months of April and May, 1919, in order to obtain data needed for the revision

of the Federal motor gasoline specification. The specification adopted during the war had been the subject of numerous complaints, and it seemed desirable to determine whether or not these objections were valid before attempting revision.

SCOPE OF THE PRESENT BULLETIN.

Much information on the economic importance of gasoline, methods of production, and methods of testing has been published, but little data seems to be available regarding the actual quality of products dispensed to the consumer. In 1915 a series of about 50 samples was collected by the bureau and studied in considerable detail. The report¹ published did not, however, deal with the subject from the point of view which is now of the greatest importance. The analytical methods used in the first investigation were different from those which have later been recommended as standard by the bureau, and the experiments were concerned more extensively with the basic physical and chemical properties of the gasoline than with their commercial utility.

The present bulletin furnishes, in addition to the analytical figures, fairly complete data on the production, consumption, and quality of gasoline. Numerous inquiries received by the bureau have indicated that there is decided need for the publication of such information in a single volume that can be readily used for purposes of general reference. This bulletin, therefore, includes considerable material which does not bear directly on the report of the two gasoline surveys, but is of interest to producers and consumers of motor fuel.

ARRANGEMENT OF MATERIAL.

The material presented in the bulletin has been divided in four chapters, as follows:

1. General information on gasoline;
2. Report of the 1919 gasoline survey;
3. Report of the 1917 gasoline survey; and
4. General summary and comparison of gasolines marketed in 1917 and 1919.

The survey of 1917 is reported after the one for 1919, chiefly on account of convenience in presenting the information. The latter survey was more comprehensive than that of 1917 and giving it precedence permits a complete description of analytical and sampling methods, which can also be used for reference in discussing the 1917 survey. If the 1917 survey were presented first, the description would have to be split between the two chapters.

¹ Kirtman, W. F., Jones, W. A., and Dean, E. W., Physical and chemical properties of gasoline sold through the calendar year 1915: Tech. Paper 163, Bureau of Mines, 1916, 45 pp.

The analytical figures obtained through the analysis of some 1,100 samples collected in the two surveys necessitated the preparation of extensive tables. These tables, being necessary chiefly for purposes of detailed reference, are printed as an appendix; the important conclusions based on these figures are summarized in briefer and more concise tables which appear in the text, supplemented, wherever possible, with curves and diagrams.

ACKNOWLEDGMENTS.

Particular credit is due to J. O. Lewis, chief petroleum technologist of the bureau, for any success attained in the work covered by this report. Mr. Lewis rendered valuable assistance in outlining the work of the 1919 survey and has given much aid in the preparation of the bulletin.

The 1917 survey was begun at the suggestion of and under the direction of Chester Naramore, at that time chief petroleum technologist of the bureau. Mr. Naramore has at all times evinced enthusiastic interest in the progress of the work, and grateful acknowledgment is made for his helpful suggestions and generous cooperation.

The following members of the petroleum division of the bureau assisted in collecting samples: C. P. Bowie and A. R. Elliott, of the San Francisco office; M. J. Gavin, of the Salt Lake City station; H. R. Pierce, of the Bartlesville station; W. A. Jacobs, of the Pittsburgh station, and C. R. Bopp, of the Washington office.

Also, members of the various field stations of the bureau, numerous colleges, universities, commercial clubs, and city officials gave valuable assistance in collecting samples in cities not visited by representatives of the petroleum division. The number of such individuals and organizations is so great that special mention of each is practically impossible. Their assistance is, however, collectively acknowledged; it has been heartily appreciated.

The cooperation of refiners and marketers of gasoline is also acknowledged. There was an almost universal interest in the work of the bureau and a hearty desire to provide the information and assistance requested.

The gasoline samples were analyzed by the following members of the petroleum division: A. D. Bauer, C. R. Bopp, S. M. Brown, G. S. Cavanaugh, D. C. Dunn, W. A. Jacobs, R. E. Mason, N. A. C. Smith, and D. D. Stark. Particular credit is due Messrs. Bopp, Mason, and Smith, who aided in compiling and arranging tables.

Statistics relating to refinery production were collected under the direction of H. F. Mason, petroleum economist of the bureau. Mr. Mason gave valuable assistance in arranging the data relating to production and exports of gasoline.

CHAPTER 1.—GENERAL INFORMATION.

ECONOMIC IMPORTANCE OF GASOLINE.

Gasoline was at one time a by-product of petroleum refining incident to the production of kerosene, and its disposal was a troublesome problem. At present it is the most needed derivative of petroleum. Gasoline now represents more than a fourth of the volume of products refined from petroleum, and in the aggregate its value is practically equal to the total value of all the other products. Its principal use is as fuel for internal-combustion engines, particularly for those used in motor vehicles. It is also used in the dry-cleaning industry, the rubber industry, and to some extent for heating and lighting.

On the assumption that the 1918 refinery production of gasoline and naphtha (3,570,312,963 gallons) in the United States was sold at an average price of 18 cents per gallon (f. o. b. refinery) the value of the production approximates \$650,000,000. A total of some 6,000,000 automobiles and trucks, having an estimated value of more than \$5,000,000,000 was practically dependent on gasoline as a source of motive power. Gasoline is also the principal fuel of a large number of stationary engines, marine engines, and airplane engines, the monetary value of which has not been included in the above estimate. The intensive use of gasoline in the war and the care taken in safeguarding shipments indicate its military importance. Automobiles, trucks, motor cycles, motor-boat engines, stationary engines, tractors, "tanks," and airplanes required it. The success of military operations depends in large degree on the mobility of troops and munitions, and gasoline has proved a most important factor in attaining quick transit.

The present importance of gasoline has been augmented by failure to develop satisfactory substitute fuels. Although the demand has been increasing rapidly and there have been threatened shortages of supply, no fuel has yet been marketed on a large scale which seems likely to replace gasoline in the immediate future. The possibility of developing satisfactory substitute fuels is not denied, but the fact remains that at present gasoline stands practically alone as a fuel for automobiles and trucks.

Some motor fuels that have recently come on the market contain considerable proportion of coal-tar distillates, such as benzol and toluol, and at least one contains alcohol. These fuels, however, have not been marketed in sufficient quantity to merit consideration as

important sources of supply, nor do they promise to attain such importance in the near future. They are not, however, to be regarded as inferior substitutes for gasoline and the indications are that they will prove satisfactory.

PRODUCTION OF GASOLINE.

SOURCES OF PRODUCTION.

Gasoline is obtained from three sources, (a) from crude oil by distillation, (b) from natural gas by compression or absorption, and (c) from heavy petroleum oils by cracking.

PROPERTIES OF GASOLINE DERIVED FROM THE THREE SOURCES.

GASOLINE FROM CRUDE PETROLEUM.

Gasoline made by the distillation of crude petroleum, generally known as "straight-run" gasoline, was at one time the only product on the market and for that reason is popularly believed to be the best type obtainable. Many automobile users have been educated to demand "straight-run" gasoline, and feel that the more common blended types are inferior substitutes. As an actual fact, the major part of the gasoline marketed to-day is some sort of blend, particularly in certain sections of the country. Many of the blended products are preferable to straight-run products, particularly if the added constituent is so-called "casing-head" gasoline derived from natural gas. Casing-head blends contain larger percentages of low-boiling constituents than do straight refinery gasolines of the same end point, and on this account possess superior "starting" qualities, particularly for use in cold weather.

GASOLINE FROM NATURAL GAS.

So-called "casing-head" gasolines obtained from natural gas by processes of compression or absorption, are rarely if ever marketed in their original state. Casing-head gasoline is too volatile to be shipped or to be used except for certain special purposes, such as the operation of gasoline-gas machines; usually it is blended with straight-run gasoline or naphtha at the plant where it is produced. In rare instances it is blended with kerosene, but the resulting product is not at present regarded as a very satisfactory motor fuel.

GASOLINE MADE BY CRACKING PROCESSES.

So-called "cracked" gasoline, made by the decomposition under heat and pressure of heavy petroleum fractions, is seldom marketed without blending. It is manufactured chiefly by refining companies that control large supplies of "straight-run" gasoline and casing-head gasoline, and is usually marketed as a blend with these other two types of products.

STATISTICS ON GASOLINE PRODUCTION.

PRODUCTION OF "STRAIGHT-RUN" GASOLINE.

Processes for separating gasoline from crude petroleum have been developed to such an extent that for present purposes the potential production of such gasoline may be regarded as practically equivalent to the production of crude petroleum. The marketed production of crude petroleum for the past 15 years (1904 to 1918, inclusive), is shown graphically in figure 1. The data used in compiling this

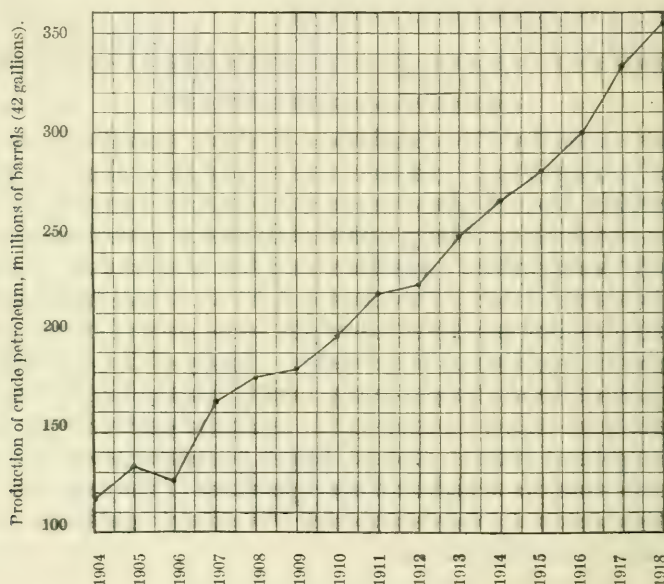


FIGURE 1.—Curve showing increase in marketed production of crude petroleum in the United States, 1904-1918.

curve were obtained from annual production statistics published by the United States Geological Survey.¹ The 345,500,000 barrels of crude petroleum produced in 1918 in the United States might be increased by the addition of 27,000,000² barrels of crude oil taken from storage, and 37,735,000³ barrels imported, making a total consumption for the year of 410,235,000 barrels. Some of the crude, particularly that imported, did not produce any gasoline, but was used directly as fuel oil. Some of the crude produced in the United States was also used without refining, and the figure appearing in

¹ For the years 1904 to 1916, inclusive, Northrup, J. D., *Petroleum in 1916*, Mineral Resources of the United States, (U. S. Geol. Survey, April, 1918, pt., 2, pp. 679-886.) For the year 1917, U. S. Geol. Survey Press Bull. 375, July, 1918, 1 p. For 1918, estimate by U. S. Geol. Survey, published in the Oil, Paint, and Drug Reporter, vol. 11, Jan. 8, 1919, p. 11.

² Oil, Paint, and Drug Reporter, same reference, place cited.

³ Monthly Summary of the Foreign Commerce of the United States, Bureau of Foreign and Domestic Commerce, December, 1918, p. 23.

Bureau of Mines statistics for crude oil actually run through refineries in 1918 is 326,024,630 barrels.

The curve shows that, with the exception of 1906, when there was a decrease compared with 1905 (owing to a decided decrease of output in the Gulf field) the increase in production of crude oil has been gradual and fairly uniform. Breaks in the curve for the years 1909 and 1912 can be credited to decreased production in the Gulf Coast and Illinois fields in 1909 and in the Mid-Continent and Gulf Coast fields in 1912. Other fields of course have fallen off notably, but in general the deficits have been met by the discovery of new fields or by the increase in production from those already developed, with the result that a peak in production has not yet been reached. The

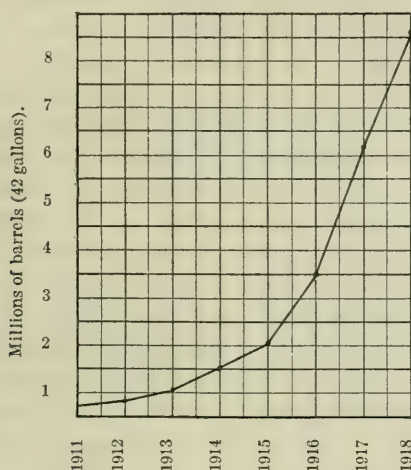


FIGURE 2.—Curve showing increased production of casing-head gasoline, 1911-1918.

discovery and development of fields in northern Texas have been largely responsible for the moderate increase in output for 1918 as compared with 1917.

PRODUCTION OF CASING-HEAD OR NATURAL-GAS GASOLINE.

Figure 2 represents graphically the production of gasoline from natural gas for the years 1911 (the first year these statistics were collected) to 1918, inclusive.⁴ The figure for the year 1918 is an estimate made by assuming that the volume increase in production for 1918 over 1917 was approximately the same as the volume increase in production for 1917 over 1916. The quantity represented includes production by both compression and absorption processes.

⁴ Northrup, J. D., *Natural gas gasoline in 1917*: Mineral Resources U. S., pt. 2, U. S. Geol. Survey, 1919, pp. 1g to 21g.

Obviously the production of natural-gas gasoline is increasing with great rapidity, the production for the calendar year 1918 being approximately 43 times that for 1911. The production of casing-head gasoline is of even greater importance than the actual quantity may indicate, as it is marketed in the form of blends with naphtha or heavy gasoline and has rendered available as motor fuel considerable quantities of distillates that in their original state lacked a large enough proportion of low-boiling constituent to make satisfactory motor fuels.

PRODUCTION OF CRACKED GASOLINE.

No comprehensive statistics are available to indicate the total amount of gasoline produced in 1918 by cracking heavy distillates. Information received from Dr. Burton, president of the Standard Oil Co. of Indiana, which is the largest operator of cracking stills, indicates that the probable total output during the year was 8,000,000 barrels, or approximately 10 per cent of the total gasoline produced. Practically all of this was made by the Burton process, which was developed and is controlled by the company mentioned, but is leased to certain other companies, principally of the Standard group. It has been stated ⁵ that in the five years preceding 1918 the Burton process produced a total of more than 20,000,000 barrels of gasoline. Several other cracking processes are now being operated on a commercial scale, but the quantity of gasoline produced by them is small in relation to that produced by the Burton process. A number of other processes for manufacturing gasoline from heavy oils have been invented and tried out, but have not advanced beyond the experimental stage.

STATISTICS ON REFINERY OPERATION.

SOURCES OF STATISTICAL INFORMATION.

In July, 1917, agents of the Bureau of Mines visited the offices of refineries throughout the country and obtained statistics on the output of petroleum products for the calendar year 1916 and the first six months of 1917. Since obtaining these initial statistics the bureau has organized an office that collects each month, from practically every refinery in the country, figures giving the consumption of crude and the output of various products. Primarily, the collection of these statistics was a military measure and the collected data enabled various Federal organizations to keep in touch with the production of petroleum derivatives, and thereby take the measures necessary to divert the products in greatest demand to channels where they would be of most use.

⁵ Burton, W. M., Chemistry in the petroleum industry: Jour. Ind. and Eng. Chem., vol. 10, 1918, pp. 484-486.

The only available figures showing the refinery output of gasoline for the years prior to 1916 are those published by the Census Bureau in the Census of Manufacturers, which is taken every five years.⁶ The refinery production of gasoline since 1904, as indicated by Bureau of Census and Bureau of Mines data, is shown by the figures in Table 1.

TABLE 1.—*Data on refinery production of gasoline in the United States for period of 15 years, 1904 to 1918, inclusive.*

[The unit barrel is 42 U. S. gallons.]

Year.	Crude run to refineries, barrels.	Production of gasoline, barrels.	Yield of gasoline.	
			Per cent.	Gallons of gasoline per barrel of crude run.
1904.....	66,982,862	6,920,000	10.3	4.3
1909.....	120,775,439	12,900,000	10.7	4.5
1914.....	191,262,724	34,915,000	18.3	7.7
1916.....	246,992,015	49,020,967	19.8	8.3
1917.....	315,131,681	67,870,153	21.6	9.1
1918.....	326,024,630	85,007,451	26.1	11.0

PREPARATION OF STATISTICS.

Products more volatile than kerosene can be roughly divided into two classes—gasoline and naphthas—the distinction being partly the properties of the products and partly the uses to which they are put. Distillates sold for use in internal-combustion engines are generally classed as gasoline. There is no clear-cut difference in properties, but in general naphthas have a considerably higher average boiling point and a narrower distillation range than gasoline. For general purposes naphtha may be regarded as a product that has approximately the same upper boiling limit as gasoline, but lacks the volatile fractions, included in the latter, that permit easy starting of automobile motors. The statistics make no distinction between the two types of products, and the figures given include both gasoline and naphtha production, although that of the latter is small in relation to the total gasoline production.

The figures for refinery production include gasoline manufactured by cracking processes, but do not include all of the casing-head gasoline. A certain proportion of this casing-head distillate goes to the refineries before appearing on the market and is included in refinery statistics. The balance is blended at the various absorption or compression plants with enough naphtha to make a product suitable for marketing. The amount of casing-head gasoline used by refineries

⁶ Census of Manufacturers, 1914—Reports for selected industries and detailed statistics for industries by States: Bureau of Census, vol. 2, p. 582. See also Report of the Secretary of the Interior to the U. S. Senate: Senate Doc. 310, Feb. 3, 1916, p. 7.

in the calendar year 1918 was given as 2,451,338 barrels, which is approximately 30 per cent of the total production of casing-head gasoline.

Figures in Table 1 show a rapid increase in the production of gasoline since 1904, the gain being more than 1,100 per cent for the 15-year period, 1904 to 1918, and more than 100 per cent for the 5-year period, 1914 to 1918. Before 1904 the production of gasoline seems to have been fairly constant, as Census figures show a production of 6,680,000 barrels in 1899 and 6,920,000 barrels in 1904.

UNIT PERCENTAGE YIELD OF GASOLINE FROM CRUDE OIL.

In 1904 the yield of gasoline amounted to 10.3 per cent of the crude oil run to refineries, whereas in 1918 the yield was 26.1 per cent. In other words, the rate of yield of gasoline increased 155 per cent in the 15-year period, 1904 to 1918, inclusive. The increase in percentage yield was particularly noticeable between 1916 and 1918, the gain for this period being approximately 33 per cent. In part the increases are due to improvements in refinery equipment and to the relatively greater proportion of light crude refined, but the principal causes were the extensive use of cracking processes and the widening of the volatility range of gasoline. The use of casing-head gasoline is also a factor of great importance, both directly and by permitting the widening of the volatility range by blending with the heavy naphthas.

IMPORTANCE OF THE CHANGE INVOLVING PRODUCTION OF LESS VOLATILE GASOLINE.

Users of gasoline evince generally a tendency to condemn present grades of motor fuel and discuss the "good old days" when 76° gasoline was one of the less volatile products on the market, but many of them fail to realize that the demand for gasoline has increased much more rapidly than has the production of the raw material from which gasoline is derived. The production of crude oil has, it is true, continued to increase, but the gains in production are not of the same order as the increases in the demand for gasoline. Refiners have been forced not only to handle more crude but to get more motor fuel out of each unit quantity of crude they refine. One of the important ways of doing this has been to "cut deeper into the crude," and to market as gasoline certain fractions that formerly were included with the kerosene. The result has, of course, been the production of gasoline of higher average boiling point, or in other words, lower volatility.

In earlier days kerosene was the most valuable of the lighter petroleum distillates and every effort was made to obtain maximum

yields of this commodity. As only enough gasoline was distilled off to permit the kerosene to meet flash-point requirements, the resulting by-product was naturally very volatile and had a very high Baumé gravity. At present the accepted refinery practice is to market as gasoline all petroleum fractions that are volatile enough to permit reasonably efficient utilization in internal-combustion engines. It is sometimes said that present gasolines contain certain percentages of kerosene; the statement is not accurate. The gasoline does contain constituents that were formerly marketed as kerosene, but they are only the lighter or lower boiling fractions of kerosene; the properties of present motor fuels are entirely dissimilar to the properties of mixtures of "high test" gasoline and ordinary kerosene.

The change of volatility of gasoline is indicated by the following figures. Several years ago it was customary to market gasoline having gravities of 70 to 76° B. and end points (upper boiling limits) of 300 to 350° F. At present the average motor gasoline has a gravity of 54 to 60° B., depending upon the type of crude oil from which it is made, and an end point of 410 to 430° F. This change admittedly has not improved the gasoline, particularly as it affects the convenience in operating automobile engines, but has had the decided advantage of insuring to the user an abundant and perfectly distributed supply of motor fuel, whereas maintenance of the higher standard of quality would have resulted in unavoidable shortages of supply and in a sharper increase in cost. The necessity for this change in volatility is illustrated by the curves (fig. 6) on page 19, which show that the demand for gasoline has increased more rapidly than the supply, and that it may even be necessary to submit to further decreases of volatility in the future.

So-called "high test" gasoline has been obtainable up to a recent date in certain sections of the country, particularly in the Pittsburgh district. The lightest and most volatile of the several grades marketed was discontinued during the war on account of the necessity of producing large quantities of volatile airplane gasoline. There seems to be little prospect that the light gasoline will be available again, nor is its return desirable from an economic point of view. In certain districts, there is still a marked demand for a grade of gasoline more volatile than the usual type. Consumers are willing to pay an additional 3 to 5 cents a gallon for this type of gasoline, and it continues to be available in limited quantities. In most sections of the country only one grade of gasoline is generally marketed.

It has been estimated⁷ that if all the gasoline now produced were of a volatility equivalent to that of the so-called 76° grade the yield

⁷ Report to the Director of the Oil Division, U. S. Fuel Administration, "Potential production of airplane gasoline," by H. H. Hill, E. W. Dean, and J. P. Smootz. (Unpublished.)

would be reduced approximately one-half, and if the general standard of volatility were that of four or five years ago production would be reduced approximately one-quarter. This estimate shows the important effect of change of volatility upon percentage yield of gasoline from crude oil.

IMPORTANCE OF THE USE OF CRACKING PROCESSES.

The use of pressure distillation cracking processes has had a noticeable effect in increasing the yield of gasoline. According to an estimate previously mentioned, the Burton cracking process has furnished more than 10 per cent of the total gasoline produced in this country since the process was first put in operation on a commercial scale. This additional amount has been rendered available without increasing the production of crude petroleum, and has been of prime importance both in preventing shortages of motor fuel and in conserving the supply of crude. To produce an equivalent amount of refining gasoline would have required more than 100,000,000 barrels additional of crude oil.

If the necessity continues for using gasoline having about the same average volatility as that now being marketed, a more extended use of cracking processes is highly essential. During the war conditions were not favorable for extending their use, particularly on account of the relatively brisk demand for fuel oil, which is the raw material used for cracking. However, the price of fuel oil is now such that cracking processes can be operated at sufficient profit to make desirable their employment by practically all types of refineries. It is believed that in the reasonably near future, processes now in the experimental stage may be put into commercial operation or that arrangements may be made for the wider use of processes already developed.

Another solution of the problem of preventing a shortage of gasoline would be the development of internal-combustion engines capable of utilizing less volatile fuel. Automotive engineers are working strenuously to accomplish this desired end, and if their efforts succeed it may prove unnecessary to increase the proportion of cracked gasoline turned out by the refiners. The question of whether it is more desirable for the refiner to produce fuels which will fit the present type of engines or for the engineer to develop engines which will fit the fuels that are normally available is still unsettled.

IMPORTANCE OF CASING-HEAD GASOLINE.

The actual importance of casing-head gasoline in increasing the total supply of motor fuel is greater than might be indicated by the figures showing production of this material. The raw casing-head

gasoline produced in 1918 was less than 10 per cent of the total gasoline production, but this 10 per cent rendered available as motor fuel at least an equal quantity of naphtha which lacked the low-boiling constituents essential for a satisfactory motor fuel.

Much of the casing-head gasoline was marketed as blends with heavy naphtha, these blends being produced in the plants treating casing-head gas. However, the casing-head gasoline can be perhaps blended more efficiently by the refinery than by a blending station, at least as regards the quality of the resulting product. Blends of casing-head gasoline and heavy naphtha are likely to be deficient in the fractions of intermediate boiling point, whereas blending with an ordinary "straight-run" distillate of high end point gives a more uniform range of volatility. Whether this latter practice, all factors considered, is preferable to the former has not been conclusively demonstrated; but there is reason to suppose that it is.

The extent to which casing-head gasoline is now being used by some of the large refineries is illustrated by figure 22 (p. 106), which shows average distillation curves for gasoline marketed by six representative companies in the calendar years 1917 and 1919. These curves reveal that the average end point of the samples collected in 1919 is appreciably higher than those of the 1917 samples, but the proportion of material distilling below the boiling point of water (100°C. or 212°F.) is practically the same, being higher for some of the 1919 samples than for the 1917 set. This indicates the considerable increase in use of casing-head gasoline by some of these refiners, as otherwise elevation of the end point would have caused a decrease in the proportion of low-boiling constituents. The analyses of the 1919 gasoline survey show that the distribution of casing-head gasoline is by no means uniform. A number of samples tested were deficient in low-boiling material, whereas others contained percentages apparently higher than necessary. A more even distribution of casing-head gasoline would undoubtedly assist in increasing the percentage yield of gasoline from crude oil.

THE CONSUMPTION AND STORAGE OF GASOLINE.

RELATION BETWEEN THE TOTAL QUANTITY OF GASOLINE PRODUCED IN THE UNITED STATES AND THE QUANTITY EXPORTED.

Figures for exports of gasoline and naphtha for the years 1904 to 1918, inclusive, appear in Table 2. The data in this table were compiled from various issues of the Monthly Summary of Foreign Commerce of the United States, Bureau of Foreign and Domestic Commerce. Previous to 1912 no distinction was made between two products, gasoline and naphtha, both being included as "Naphtha and light products of distillation." Beginning in 1912 a division was

made into "gasoline" and "naphtha and light products of distillation other than gasoline." As naphtha is included with gasoline in the refinery statistics collected by the Bureau of Mines, the recent reclassification of the Bureau of Foreign and Domestic Commerce has been disregarded here; the figures represent the sum of both types, reported as "Exports of gasoline and naphtha."

TABLE 2.—Data showing exports of gasoline and naphtha for the calendar years 1904 to 1918, inclusive.

Year.	Exports to foreign countries, gallons.	Shipments to Alaska, Hawaii, Porto Rico, and Philipines, gallons.	Total shipments.		Refinery production of gasoline, barrels.	Percentage exported.
			Gallons.	Barrels (42-gallon).		
1904.....	24,989,422	682,069	25,672,491	611,250	6,920,000	8.9
1905.....	28,419,930	1,143,692	29,563,622	703,886		
1906.....	27,544,939	1,252,244	28,797,183	685,647		
1907.....	34,625,525	1,420,567	36,046,092	858,240		
1908.....	43,889,844	2,013,472	45,903,316	1,092,936		
1909.....	68,758,675	2,230,856	70,989,531	1,690,227	12,900,000	13.1
1910.....	100,695,382	2,955,306	103,650,688	2,467,874		
1911.....	137,294,606	4,749,396	142,044,002	3,382,000		
1912.....	186,000,094	8,034,822	194,034,916	4,619,879		
1913.....	188,043,379	6,788,746	194,832,125	4,638,622		
1914.....	209,692,665	9,076,060	218,768,725	5,208,779	34,915,000	14.9
1915.....	281,609,081	9,946,542	291,555,623	6,941,800		
1916.....	356,217,125	14,018,691	370,235,816	8,815,138	49,020,967	18.0
1917.....	415,878,539	14,918,100	430,796,639	10,257,063	67,870,153	15.1
1918.....	559,125,330	12,209,957	571,335,287	13,603,221	85,007,451	16.0

The figures from Table 2 are represented graphically in figure 3. It will be observed that there has been a marked increase in exportation, particularly since 1914—the first year of the war. This increase is directly attributable to the military demands, and is the more impressive when account is taken of the fact that exports to the Central Powers were practically stopped. The export figures include shipments to Alaska, Hawaii, Porto Rico, and the Philippines, as well as those consigned to the American Expeditionary Force. Figures for the production of gasoline in the United States for the years for which statistics are available are also included in Table 2, and the percentages of exportation calculated. The maximum exportation is 18 per cent for the year 1916; for the last five years the figures range from this mark down to 15.1 per cent. These statistics show conclusively that the exportation of gasoline has not increased out of proportion to the total production, and that increases in the cost of gasoline can not be attributed alone to diversion of this commodity to foreign markets.

DOMESTIC CONSUMPTION OF GASOLINE.

Statistics permitting the calculation of domestic consumption of gasoline were first available for the month of July, 1917, when the Bureau of Mines obtained figures for stocks held by the various

refining companies. The figures for consumption were calculated as follows: If stocks for a given month have increased, the amount of increase is deducted from the figure for production for the month. If stocks have decreased, the amount is added to the production figure. From this net figure representing gasoline disposed of by refiners is subtracted the amount exported during the month, yielding a figure approximately representing domestic consumption. The fact that varying quantities may be held in storage by jobbing and marketing companies introduces a certain error, but this is not suf-

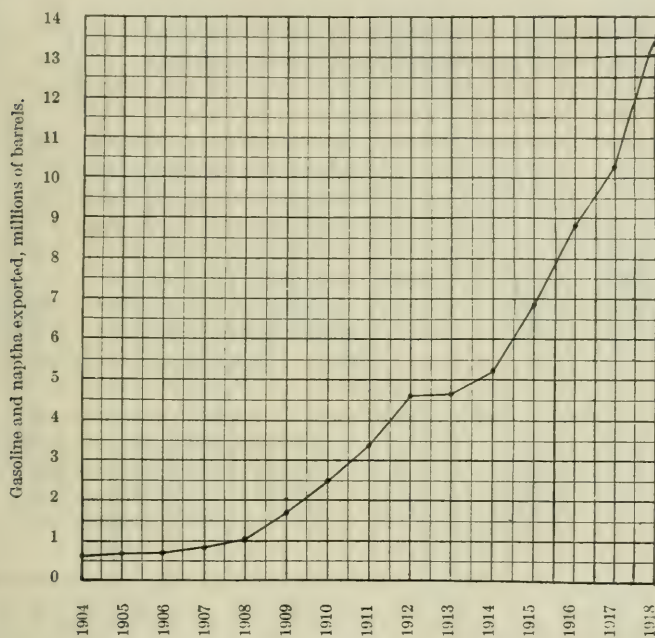


FIGURE 3.—Curve showing progressive increases in quantity of gasoline and naphtha exported from the United States, 1904-1918.

ficient to destroy the value of the data for purposes of the present discussion.

SEASONAL VARIATIONS IN PRODUCTION AND CONSUMPTION OF GASOLINE.

The figures on which this calculation is based and the resulting figures are given in Table 3, and represented graphically in figure 4, for the period July, 1917, to June, 1918, inclusive. The seasonal variations in gasoline consumption are particularly noticeable; the figures for either July or August are more than twice as large as those for any of the winter months.

In this connection, attention is called to the rapid depletion of stocks for the months of July and August, 1918, which caused the Fuel Administration to request the public to refrain from using cars for a number of Sundays in the early fall. As this regulation aroused considerable protest, the Bureau of Mines prepared and submitted to Congress a report on the gasoline situation which was published as Senate Document 280.⁸ The conservation effected by these

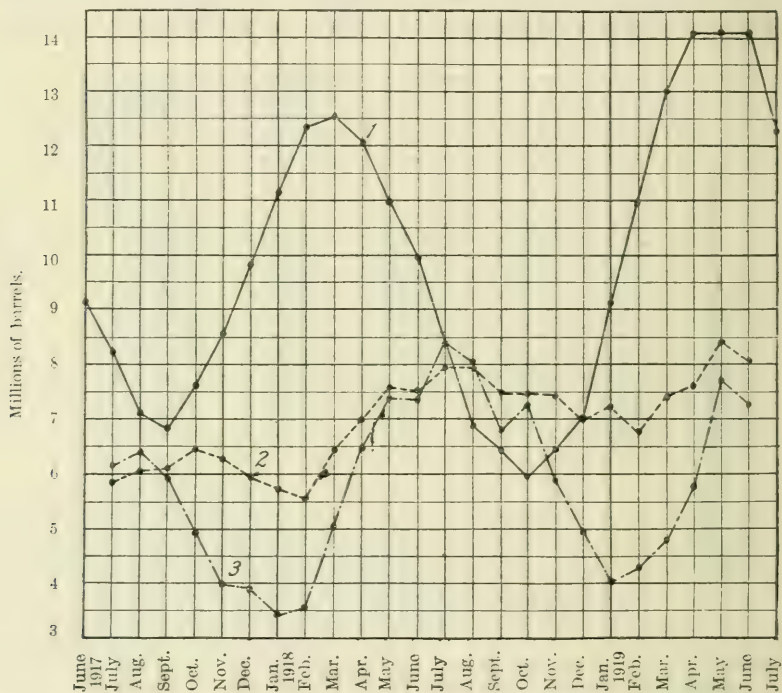


FIGURE 4.—Curves showing stocks, production, and domestic consumption of gasoline from July, 1917, to July, 1919, inclusive. 1, Stocks at end of each month; 2, production; 3, domestic consumption.

"gasolineless" Sundays is indicated by the consumption curve in figure 4. The consumption in September was less than that in August, which is usual, but was also less than that in October, which is not usual.

The data also show that there are seasonal variations in the production of gasoline, decreases occurring in the winter months. The variations are, however, less marked than those in consumption.

⁸ Production of crude oil, Sept. 24, 1918, 15 pp.

TABLE 3.—*Stocks, refinery production, exports and domestic consumption of gasoline by months, July, 1917, to July, 1919.*

1917.						
Month.	Stocks at refineries at end of each month.	Production.	Exports plus domestic consumption.	Exports including shipments to Alaska and insular possessions.	Domestic consumption.	Domestic consumption.
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Barrels.
June.....	383, 115, 992					
July.....	345, 199, 195	244, 145, 292	282, 362, 089	22, 732, 024	259, 630, 065	6, 181, 698
August.....	298, 548, 699	254, 464, 491	301, 114, 987	32, 631, 620	268, 483, 367	6, 392, 461
September.....	287, 758, 562	256, 132, 050	266, 922, 187	21, 191, 657	245, 820, 530	5, 852, 870
October.....	320, 203, 770	271, 891, 234	239, 346, 026	32, 396, 511	206, 949, 515	4, 927, 346
November.....	360, 241, 135	264, 888, 709	224, 851, 344	58, 148, 034	166, 703, 310	3, 969, 122
December.....	412, 256, 833	248, 846, 638	196, 830, 950	35, 694, 023	161, 136, 927	3, 836, 594
1918.						
January.....	469, 277, 166	242, 632, 044	185, 611, 711	42, 793, 497	142, 818, 214	3, 400, 434
February.....	518, 794, 609	234, 324, 619	184, 807, 176	36, 558, 399	148, 248, 177	3, 529, 718
March.....	526, 382, 386	269, 627, 968	262, 040, 191	47, 975, 761	214, 064, 430	5, 096, 772
April.....	509, 197, 134	293, 396, 162	320, 581, 414	48, 061, 112	272, 520, 302	6, 488, 579
May.....	460, 637, 479	319, 391, 202	367, 950, 857	57, 766, 504	310, 184, 353	7, 385, 342
June.....	418, 440, 353	315, 023, 445	357, 220, 571	50, 060, 823	307, 159, 748	7, 313, 327
July.....	349, 928, 604	332, 022, 095	400, 533, 844	48, 252, 539	352, 281, 305	8, 387, 650
August.....	285, 446, 538	330, 335, 046	394, 827, 112	58, 184, 236	336, 642, 876	8, 015, 307
September.....	269, 772, 723	314, 595, 959	330, 269, 774	46, 290, 005	283, 979, 769	6, 761, 423
October.....	250, 328, 329	314, 251, 318	333, 695, 712	38, 652, 417	295, 043, 295	7, 027, 221
November.....	270, 072, 011	312, 968, 640	293, 224, 958	47, 982, 514	245, 242, 444	5, 839, 106
December.....	297, 326, 983	291, 744, 465	264, 489, 493	54, 548, 991	209, 940, 502	4, 998, 583
1919.						
January.....	383, 212, 692	303, 710, 556	217, 825, 847	49, 009, 627	168, 816, 220	4, 019, 434
February.....	458, 449, 187	283, 518, 194	208, 271, 699	28, 738, 095	179, 533, 604	4, 274, 610
March.....	546, 062, 429	311, 306, 755	223, 693, 513	22, 723, 182	200, 970, 331	4, 785, 098
April.....	593, 616, 170	319, 807, 837	272, 264, 097	29, 819, 672	242, 444, 425	5, 772, 486
May.....	594, 035, 688	354, 472, 377	354, 052, 859	29, 420, 260	324, 632, 599	7, 729, 348
June.....	593, 896, 610	338, 376, 985	338, 476, 063	32, 772, 242	305, 703, 821	7, 278, 662

As regards stocks in general the quantity of gasoline stored at refineries decreases as consumption increases. Stocks ordinarily reach a maximum in the early spring of each year and decrease until the advent of cold weather in the fall, which restricts the use of automobiles. This general rule did not, however, hold strictly for the period under consideration. The abnormally low stocks of the summer and early fall of 1918 have already been commented upon. The reader will note that stocks for the year 1919 also show an abnormal behavior; instead of starting to decrease in the spring, they attained a maximum level in April and remained practically constant for the two subsequent months, the first decided break occurring in July. (See fig. 4.)

In studying the export figures in Table 3 the reader will observe that the amounts exported during the various months of 1919 are noticeably less than those for corresponding months in 1918. This decrease is in large measure attributable to the cessation of shipments for military purposes.

INCREASE IN USE OF GASOLINE BY AUTOMOBILES AND TRUCKS.

The increased domestic consumption of gasoline can be attributed chiefly to the phenomenal growth of the automobile and truck industry. This industry started in the late nineties and was at that time of so little importance that in the Census of Manufacturers, 1899, it was not classed as a separate industry but was grouped with carriage manufacturers. Census reports ⁹ show the total production of automobiles in the United States in 1899 as 3,723. In 1904 production had increased to 21,692. The figure in 1909 was 126,593; in 1914, 569,064; while in 1917 a maximum was reached through the produc-

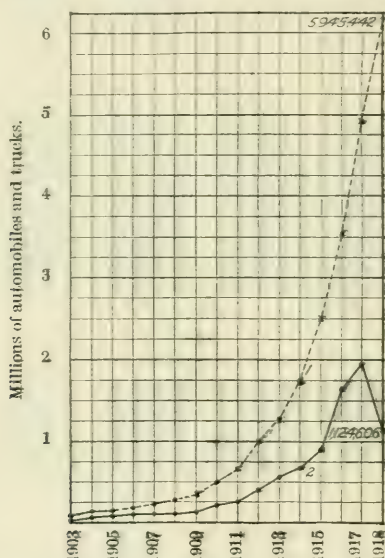


FIGURE 5.—Curves showing registration and production of automobiles for the 16-year period 1903-1918. Curve 1, Registration; curve 2, Production. (After Automotive Industries.)

tion of almost 2,000,000 cars and trucks. As in 1918 practically all plants were engaged in the manufacture of munitions of war, production dropped in that year to about 1,200,000 cars and trucks. Production and registration curves as given by Automotive Industries ¹⁰ are shown in figure 5. The increase in the number of cars registered in 1918, notwithstanding the large slump in production, was due to the fact that many of the cars manufactured in 1917 were not marketed until 1918. The reverse of this situation may have occurred in 1919, for although the output has decidedly increased, the limited production of 1918 may have resulted in a disproportionate gain or possibly a decrease in registration.

⁹ Census of Manufactures, 1914—Reports for selected industries and detailed statistics for industries by States: Bureau of Census, vol. 2, p. 732.

¹⁰ Automotive Industries, New York, vol. 4, Jan. 16, 1919, pp. 98-99.

The curves in figure 6 represent the percentage increase in production of crude oil, production of gasoline, and the registration of automobiles for the 10-year period 1909 to 1918, inclusive, compared with the year 1909. This 10-year period was chosen because it has seen the greatest advance in the use of automobiles. These curves reveal that the marketed production of crude oil increased 95 per cent, the production of gasoline 560 per cent, and the number of automobiles and trucks in use, 1,730 per cent. The varying order of these increases shows clearly the necessity for augmenting the supply of motor fuel

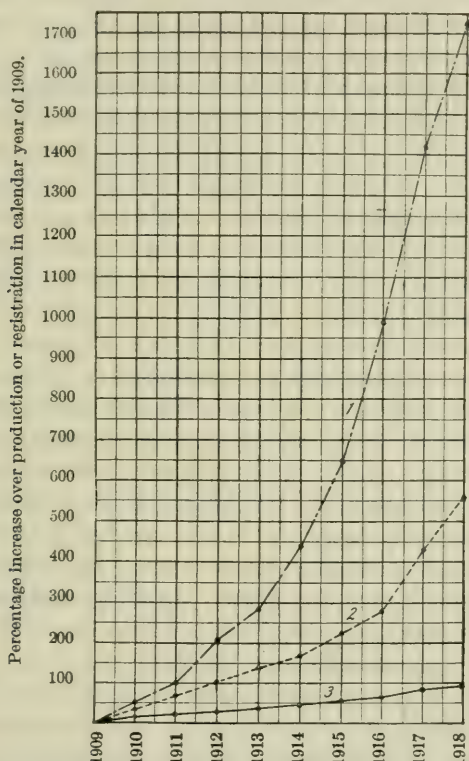


FIGURE 6.—Curves showing relative increase in registration of automobiles and trucks (curve 1), production of gasoline (curve 2), and production of crude oil (curve 3).

even through a change in quality which from some points of view is regarded as deterioration.

No single explanation is adequate to show why the gasoline supply has continued to meet the demand in the face of this enormous increase in the use of automobiles and trucks. In the year 1909, 40 barrels of gasoline was produced for each car, whereas in 1919 the ratio decreased to about 14 barrels of gasoline per car. The estimated minimum annual consumption per car has been set at 10 barrels, and the tendency of the curves in figure 6 show that this

limit is being rapidly approached. The obvious inference is that in the reasonably near future there must be a decided increase either in the output of motor fuel or else in the fuel efficiency of automotive equipment.

FACTORS RELATING TO THE CONSERVATION OF GASOLINE.

IMPROVEMENTS IN AUTOMOBILE CONSTRUCTION.

Designers and manufacturers of automotive engines have made numerous improvements in construction which have aided materially in permitting satisfactory utilization of the present grades of motor gasoline and in increasing fuel economy. Further improvements are desirable and will undoubtedly be forthcoming, while the following may be listed as already accomplished: Self-starters, short manifolds, hot-spot manifolds, provisions for heating intake air.

The self-starter, designed primarily for the convenience of automobile drivers, has been of immense value in permitting utilization of gasoline of low volatility. If cranking engines by hand were still universally necessary, the demand for volatile high-test gasoline would undoubtedly greatly exceed the supply. This is demonstrated by the fact that practically the only complaint recorded against the grade of gasoline now required by Government specification is that it does not contain sufficient light material to give satisfactory service in cars not equipped with self-starters.

The development of short manifolds, hot-spot manifolds, and devices for heating intake air have been steps in the right direction, even though details in design have not reached a state of perfection. The increased facility in atomization and vaporization obtained by heating the air-fuel mixture drawn into the engine cylinders has without question more than overbalanced the inevitable disadvantage of decreased volumetric efficiency of the engine.

Manufacturers of automotive equipment, it should be stated, are becoming thoroughly acquainted with the importance of the fuel problem, and are actively engaged in investigations aimed to bring about more efficient utilization of fuels of low volatility. Plans are being formulated by the manufacturers for general research on this subject, and a committee has been appointed to bring about cooperation with the petroleum industry in the study of the fuel situation.

POSSIBLE USE OF SUBSTITUTES FOR GASOLINE.

The development and marketing on a large scale of a satisfactory substitute for gasoline would, of course, aid materially in conserving the Nation's resources of petroleum-derived motor fuel. Numerous substitutes have been proposed which the inventors and promoters

claim will accomplish this desired end, but the absence of competition with the petroleum-refining industry is noteworthy. The inventors have failed chiefly because they did not understand the physical and chemical requirements of satisfactory motor fuel, or because they did not investigate supply and cost of their raw materials. There are, however, two types of substitute fuel now on the market which are of recognized importance, although they do not promise a real solution of the problem of motor-fuel resources.

The substitute material in one of these fuels is a mixture of hydrocarbons derived from the distillation of coal. These so-called coal-tar distillates, chiefly benzol and toluol, were in such great demand during the war that equipment for their production and recovery was tremendously increased. Since the end of the war these fuels have been studied with the idea of marketing them in such form as to be satisfactory motor fuel. Such marketing has already occurred, and information at hand indicates that the substitute fuels are being used with satisfaction. Some of the factors to be considered in regard to the use of coal-tar distillates are the following: Benzol (the correct chemical name of which is benzene) is the most volatile and the most plentiful of the hydrocarbons derived from coal. Its homologue, toluol (correct chemical name, toluene) was in greater demand as a raw material for munitions, and even before the hostilities ended there was an overproduction of benzol because its production is necessarily incident to the production of toluene. Straight benzol is undesirable as a motor fuel on account of its relatively high freezing point, 42° F. Toluene freezes at about -50° F., and when mixed with benzol reduces the freezing temperature of the latter to a satisfactory mark. The same reduction of freezing point may be accomplished by blending petroleum gasoline with benzol. A further advantage in blending benzol and toluol with petroleum distillates is that the resulting mixtures resemble gasoline more closely in their behavior in engine carburetors. The unblended coal-tar distillates can be used, but usually, perhaps invariably, adjustments in carburetion are necessary.

The recent gasoline survey made by the bureau has revealed the fact that coal-tar distillates are being marketed in some of the larger cities—such as Chicago, Cleveland, Pittsburgh, and Buffalo—mostly those having by-product coking plants near them. However, the use of such coal products is not likely to have an important influence upon the motor fuel situation except in regions thus favorably situated.

The combined amount of benzol and toluol produced in 1918 has been estimated at less than 4 per cent of the gasoline production. The possible maximum importance of coal as a source of motor fuel

has been discussed by one of the authors in a previous paper.¹¹ It was shown that if all the bituminous coal mined in the country in the year 1916 had been run through by-product ovens the total amount of so-called light oils, which is considerably greater than the quantity of benzol and toluol, would have been less than 34 per cent of the gasoline production for that year. Since that time the Nation's gasoline production has practically doubled, whereas there has been an increase of only about 17 per cent in the production of bituminous coal.¹²

Another type of substitute fuel that has appeared on the market is a blend containing alcohol as one of its important ingredients. The bureau has had little opportunity to study the marketing of this fuel, but at the time of the 1919 survey its selling price was observed to be 6 cents above the retail price of gasoline marketed in the same city. Alcohol is undoubtedly one of the important potential motor fuels, as the raw material from which it can be made is practically unlimited. However, the indications are that before alcohol can compete successfully with petroleum gasoline the latter must reach a higher price scale than now exists, and substantial modifications must be made in the design of automobile engines.

The immediate need is for a substitute fuel which can be used interchangeably with gasoline in the present types of automobile engines and without necessitating readjustment of carburetors. Unless service stations handling substitute fuels are properly distributed, it will often be necessary to fill fuel tanks with gasoline; this condition renders undesirable substitute fuels which necessitate changes in carburetion. The companies now marketing the two types of substitute fuels just discussed are without question making every effort to manufacture a product which can be used interchangeably with gasoline.

CHANGES IN PRICE OF GASOLINE.

One of the considerations of particular interest in connection with the gasoline problem is the price of the commodity. Gasoline has, in common with all other materials, advanced very considerably in price during the last 10 or 15 years. However, the examination of available statistics has shown that the increases in price have been noticeably less than for many other commodities and that they are in large measure justifiable on account of increases in cost of raw material, particularly crude oil.

¹¹ Dean, E. W., Fuel for automotive apparatus. Jour. Soc. Automotive Eng., vol. 2, January, 1918, pp. 47-53.

¹² Mineral Resources, U. S. Geological Survey, Estimate for 1918, from Coal Age, vol. 15, Jan. 13, 1919, p. 127.

RANGE OF PRICES IN NEW YORK CITY.

Figure 7 shows graphically the range in price of gasoline sold in the city of New York for the years 1904 to 1919, inclusive. The data were taken from price lists published in the Oil, Paint and Drug Reporter, effective on May 1 of each year. The quotations are for quantities supplied to retailers in steel drums—this being equivalent to the so-called tank-wagon price maintained in most other cities—and are for the grade sold as motor gasoline. In some of the earlier years the trade names of the products did not definitely indicate what they were used for, but the figures selected were evidently those for the grade generally used in automobiles. The May 1 price was chosen because the two gasoline surveys of 1917 and 1919 each covered a period of which that date was approximately the middle point.

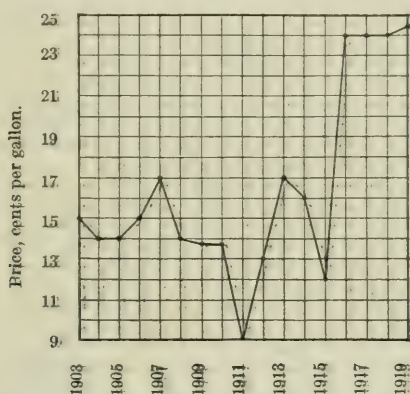


FIGURE 7.—Curve showing changes in the price of gasoline during the period May 1, 1903, to May 1, 1919. Prices are for New York City, for sales in standard steel drums, being in general equivalent to the usually quoted "tank-wagon" price in other cities.

Prices may have varied to some extent throughout each calendar year, but the May 1 quotation is undoubtedly representative.

These figures, which represent wholesale prices, are in general 2 cents lower than the retail prices; the latter, however, vary with different retailers, hence were not used for this study.

Although the price of gasoline has increased considerably during the past few years, the increase has not been unusually large in comparison with the advances in costs of practically all other commodities. The somewhat common impression that refiners have been profiteering is largely due to the fact that present prices are compared with the extremely low figure occurring in 1915. At that time gasoline fell to a lower price than any that had been maintained during a period of 15 years, with the exception of 1911. Between May, 1915, and May, 1916, there was an increase of approximately 100

per cent in the cost of gasoline, but since May, 1916, prices have remained practically constant, declining 2 cents per gallon for a few months in 1916 and rising 0.5 cent per gallon in July, 1918.

RELATION BETWEEN PRICES OF GASOLINE AND CRUDE PETROLEUM.

The important factor controlling the market price of gasoline appears to be the price of the crude oil from which it is made. This



FIGURE 8.—Curves showing that the price of gasoline has in general followed the price of crude oil: curve 1, wholesale price per gallon for gasoline in New York City; curve 2, average price of one-fifth of a barrel of crude petroleum.

is illustrated by the curves in figure 8, which show the wholesale selling price of gasoline in New York City and the average price of unit quantities of crude petroleum.¹³ The figures plotted are the prices in cents for a gallon of gasoline and for one-fifth of a barrel of crude petroleum. The latter figures were selected because they were of convenient magnitude for graphic representation in comparison with gasoline prices. It will be noted that up to 1916 the price curve for gasoline practically parallels that for crude oil, show-

¹³ Data from Mineral Resources, U. S. Geological Survey, work cited. Figure for 1918 average price of crude estimated.

ing the relation between the two figures. Since 1916 the price of crude oil has advanced rapidly while the price of gasoline has remained practically constant. This circumstance is probably due to the fact that in 1916, 1917, and 1918 refiners were able to sell fuel oil at a high margin of profit, thereby making it unnecessary to charge the usual large proportion of material and operating costs against gasoline. During 1919 there has been an unusually large production of crude petroleum containing high percentages of gasoline, and this, in addition to the unexpectedly small demand for gasoline, has kept down the price of the latter commodity.

INFLUENCE OF MARKETING PRACTICE UPON THE PRICE OF GASOLINE.

Considerable attention has been attracted to the differences in selling price of gasoline in various parts of the country. It has been noted by Pogue and Lubin¹⁴ that for the years 1916 to 1918 the price of gasoline in New York was about 2 cents higher than in Baltimore, 3 cents higher than in Chicago, 3.5 cents higher than in Kansas City, and 6 cents higher than in San Francisco. From 1913 to 1916 this difference was not so constant, the price in San Francisco being sometimes higher than in Baltimore, Chicago, and Kansas City. The prices in New York, however, were always higher than in the other cities. No figures are available for the several cities mentioned for the years previous to 1913, but it is believed that no substantial variations have occurred which militate against the value of the New York quotation for the purposes of general consideration.

At the time of the 1919 gasoline survey New York prices were higher than those of the Middle West and the Pacific coast, but lower than those of New England and the Rocky Mountain district. The tank-wagon and retail prices of gasoline in various cities in which the bureau collected samples appear in Table 4.

A further discussion of the variations in price of gasoline in various localities will be found in the publication cited by Pogue and Lubin and also in a recent report of the Fuel Administration.¹⁵

¹⁴ Pogue, J. E., and Lubin, Isadore, Prices of petroleum and its products during the war: U. S. Fuel Administration Bulletin, 1919, 55 pp.

¹⁵ Maguire, A. G., Prices and marketing practices covering the distribution of gasoline and kerosene throughout the United States: Bulletin of the Oil Division, U. S. Fuel Administration, 1919, 24 pp.

TABLE 4.—*Price of motor gasoline in various cities on date samples were collected in the course of the 1919 survey.*

[Prices in cents per gallon of gasoline.]

State.	City.	Retail price.	Tank-wagon price.	State.	City.	Retail price.	Tank-wagon price.
Alabama.....	Birmingham.....	26½	24½	Nebraska.....	Omaha.....	24	24
Arizona.....	Tucson.....	26	24	New Hampshire.....	Manchester.....	28	25½
Arkansas.....	Little Rock.....	26	24	New Jersey.....	Newark.....	25	22½
California.....	San Francisco.....	20½	20½	New Mexico.....	Albuquerque.....	32	27½
Colorado.....	Denver.....	28	26	New York.....	New York.....	27	24½
Connecticut.....	New Haven.....	25	24½	North Carolina.....	Charlotte.....	27	25
Delaware.....	Wilmington.....	27	24.3	North Dakota.....	Fargo.....	27.1	27.1
Florida.....	Jacksonville.....	26	23½	Ohio.....	Cleveland.....	25½	24½
Georgia.....	Atlanta.....	26½	24½	Oklahoma.....	Oklahoma City.....	23½	22½
Idaho.....	Boise.....	30	27½	Oregon.....	Portland.....	22½	—
Illinois.....	Chicago.....	23	23	Pennsylvania.....	Philadelphia.....	27	24.3
Indiana.....	Indianapolis.....	25	23	Rhode Island.....	Providence.....	27½	25½
Iowa.....	Des Moines.....	23	22.9	South Carolina.....	Charleston.....	27	24½
Kansas.....	Wichita.....	22.7	22.7	South Dakota.....	Sioux Falls.....	24.9	24.9
Kentucky.....	Louisville.....	25½	23½	Tennessee.....	Memphis.....	23	21
Louisiana.....	New Orleans.....	23	21	Texas.....	San Antonio.....	24½	22½
Maine.....	Portland.....	27½	25½	Utah.....	Salt Lake City.....	27	25
Maryland.....	Baltimore.....	25	22½	Vermont.....	Burlington.....	28	25½
Massachusetts.....	Boston.....	27½	25½	Virginia.....	Richmond.....	25	23
Michigan.....	Detroit.....	23.7	23.7	Washington.....	Seattle.....	21½	19½
Minnesota.....	Minneapolis.....	24	24	West Virginia.....	Wheeling.....	27	23½
Mississippi.....	Jackson.....	25	23	Wisconsin.....	Milwaukee.....	23.1	23.1
Missouri.....	St. Louis.....	22.4	22.4	Wyoming.....	Cheyenne.....	30	30
Montana.....	Missoula.....	29	28	District of Columbia.....	Washington.....	25	22½

LEGISLATION AFFECTING GASOLINE.

A number of States and a few cities have tried to regulate the quality of gasoline sold within their limits by fixing certain requirements of quality which are in effect specifications. Study of this situation has shown that the majority of these regulations are unreasonable and unscientific, and that enforcement would materially reduce the output of gasoline. Most of the laws have obviously been drafted by people lacking even an elementary knowledge of the methods of producing or analyzing gasoline. The least objectionable of the various legal acts are those that provide for increased safety in the handling of gasoline, and those that accept as a standard of quality the existing Government specification for motor gasoline. Some of the legislative acts were based on gravity specifications. The uselessness of such specifications has been clearly demonstrated, and it is generally recognized by all people acquainted with the basic differences among the constituents of various types of crude petroleum. The gravity test does not make allowance for these differences in nature of the constituents of gasoline, nor does it distinguish between products manufactured by different processes. Gravity tests may sometimes serve as an index of the distillation range of gasoline, which is the best indication of its properties, but this relation is at most only accidental. Even a distillation test is not necessarily a reliable index of the quality of gasoline unless the

method of conducting the test is closely defined. For example, some of the State specifications include distillation requirements but omit to specify the method of making the test. Such neglect affords unlimited possibility of dispute, for a sample that had been found satisfactory by the testers of the marketing company might be rejected by a State inspector if he employed a different analytical method.

In order to obtain information regarding gasoline specifications in effect in various States, Dr. G. W. Gray, head of the Bureau of Refining, United States Fuel Administration, requested different States to submit copies of their regulations covering the quality of gasoline. The following list shows which States and cities have gasoline requirements and indicates the nature of the requirements. Dr. Gray's report was published by various petroleum journals, including the National Petroleum News.¹⁶

EXTRACTS FROM STATE AND MUNICIPAL LAWS.

ARKANSAS.

Gravity shall be taken at 60° F., and marked on tank, can, cask, barrel, or other vessel containing said gasoline.

CALIFORNIA.

No law.

LOS ANGELES, CALIF.

Has adopted Motor Transport specification.

COLORADO.

Gravity shall be taken, but no products shall be offered for sale which contain more than 5 per cent of solid matter.

GEORGIA.

Gravity shall be taken and no product known as gasoline, benzine, or naphtha shall be offered for sale unless casks, barrels, or packages containing such products are labeled with figures denoting gravity and the words "Gasoline," "Benzine," or "Naphtha," in large red letters.

IDAHO.

The standard adopted by the Bureau of Mines shall be the standard for Idaho.

INDIANA.

Gravity shall not be less than 56° B., and the corrections for temperature shall be 1° B. for 10° F.

ILLINOIS.

There is no law, except that gasoline must be branded, "Condemned for illuminating purposes."

IOWA.

Gravity shall be between 80° and 70° B. Boiling point shall not be below 150° F. and not above 210° F. All other products shall be branded "Substitute for gasoline," and these substitutes shall be sold under label, which label shall be printed in large, legible type, etc., defined as follows:

(a) Per cent of, boiling below 135° F.

(b) Per cent of, boiling between 135 and 210° F.

¹⁶ Gray, G. W., Requa would standardize gasoline: Nat. Petroleum News, vol. 21, Feb. 26, 1919, pp. 11-13.

(c) Per cent of, boiling between 210 and 302° F.

(d) Per cent of, boiling above 302° F.

Bills of lading and the labels of such substitutes shall call attention to the danger of such low boiling point.

KANSAS.

Gravity must not be heavier than 58° B., initial boiling point shall not exceed 90° F., end boiling point not above 410° F. All products sold not meeting this test shall be known and sold as "Gasoline under test."

MICHIGAN.

No law.

GRAND RAPIDS, MICH.

Twenty per cent shall distill over, at, or below 220° F.

Fifty per cent shall distill over, at, or below, 300° F.

End point not above 450° F. If product does not meet this test it shall be known as a mixed gasoline-kerosene.

DETROIT, MICH.

Same law as Grand Rapids, but method of distillation is entirely different. Gasoline passing Grand Rapids specification by their method of distillation might be rejected by Detroit.

MINNESOTA.

Gravity shall be taken and containers shall be marked "Unsafe for illuminating purposes."

MISSOURI.

Gravity must not be less than 50° B.

MONTANA.

Any gasoline used for heating, burning, or power purposes in any automobile, engine, or in any machinery which falls below 63° B. shall be deemed below standard, but nothing in this act shall prevent the sale of a heavier product, when product is sold under its proper commercial name and its specific gravity given.

NEBRASKA.

Gravity shall be taken and marked upon the container.

NEW MEXICO.

No gasoline for illuminating purposes can be sold which is less than 63 per cent gravity, and it shall be conclusively presumed that all sales are for illuminating purposes unless containers are marked "Not for illuminating purposes."

NORTH CAROLINA.

The initial boiling point not higher than 158° F., 16 per cent off at 230° F.; residue not more than 35 per cent at 302° F.; end point not higher than 437° F.

NORTH DAKOTA.

Gravity shall be taken and all gasoline sold for household purposes shall show not less than 3 per cent off at 158° F., and not more than 6 per cent residue at 284° F.

OHIO.

Shall be branded according to its commercial name and with the word "dangerous."

OKLAHOMA.

Gravity shall be taken. If gravity is greater than 74° B., it shall be deemed unsafe and its sale is prohibited for use in vapor stoves or other domestic purposes.

SOUTH CAROLINA.

Flash point not more than 32° F.; distillation test not more than 26 per cent off at 230° F.; not more than 16 per cent of residue at 302° F. dry point not more than 392° F. Any product not meeting this specification must be sold under the name of "Naptha."

SOUTH DAKOTA.

"Power Gasoline."—Gravity not less than 57° B.; residue not more than 25 per cent at 300° F., and not more than 3 per cent at 400° F.

Below is a table giving gravities depending upon what crude the products are made from:

Gasoline for use in automobile engines and in other gasoline engines should have a gravity of not less than 57° B., Mid-Western field; 62° B., Pennsylvania field.

TENNESSEE.

The container shall be branded, "Gravity not less than ——— B.; unsafe for illuminating purposes; for power purposes only."

UTAH.

Standards adopted by the Bureau of Mines shall be the standard for this State. No product shall contain more than 1 per cent of solid matter.

WASHINGTON.

Shall be inspected for its specific gravity and all containers shall be branded with the specific gravity.

WISCONSIN.

Containers shall have gravity stamped on same.

WYOMING.

Gasoline for power purposes. Not less than 10 per cent off at 170° F.; not less than 50 per cent off at 240° F.; not less than 94 per cent off at 350° F.

DISCUSSION OF VARIOUS STATE AND MUNICIPAL GASOLINE REQUIREMENTS.

The Colorado law includes a requirement to the effect that gasoline shall not contain more than 5 per cent of solid matter. Inasmuch as even the most carelessly refined gasoline contains only negligible quantities of solid material, and as the presence of even a fraction of 1 per cent solid matter would cause unlimited trouble in motors, the basis of this requirement is difficult to understand. A similar requirement is in effect in Utah, but the limit is 1 per cent. Even this, however, is absurd, and no refining company would dare market gasoline containing 1 per cent of solid matter on account of the complaints that would be certain to come from users.

The Iowa law requiring that the gravity of gasoline be between 70 and 80° B. rules out practically all the grades of gasoline produced

in the country. If this law is enforced all gasoline sold in the State must be labeled "Substitute for gasoline." Even if the gravity requirement were eliminated the requirement that the initial boiling point of the gasoline be not below 150° F. would discriminate against the grades of gasoline that are generally regarded as most desirable. This requirement is undoubtedly intended to insure the marketing of gasoline that is safe in storage and handling, but the safer a gasoline is, the harder it is to use in a motor, particularly in cold weather. The requirement that the initial boiling point be not above 210° F. is entirely inadequate to insure that the gasoline will contain sufficient volatile constituents to permit ready starting even in moderately warm weather.

The Kansas law goes to another extreme in requiring gasoline that will give extra ease in starting, but be unnecessarily dangerous and subject to high evaporation losses. The requirement of an initial boiling point below 90° F. would eliminate practically all gasoline now marketed with the exception of blends containing high percentages of casing-head gasoline. The requirement that the end point shall not exceed 410° F. and that the gravity shall not be heavier than 58° B. does not conform to present refinery practice in the Middle West, and as a result products sold in the State of Kansas are, in the words of the legal act, "Gasoline under test."

The requirements in effect in the cities of Grand Rapids and Detroit specify a grade of gasoline approximately equivalent to the average marketed in that section of the country. The two cities, however, base their distillation requirements on two different methods, thereby introducing a possibility of discrepancy.

The requirement of a minimum gravity of 63° B. which is in effect in the State of Montana is too strict for present conditions and renders it necessary to consider practically all gasoline sold in the State as below standard. The specification in effect in North Carolina is reasonable and has obviously been drafted by men familiar with the composition of present grades of motor gasoline. The requirement would, however, discriminate against grades of gasoline that are commonly sold in various other parts of the country.

The South Carolina specification is a reasonably well balanced one, but requires a grade of gasoline that is considerably more volatile than that generally accepted as satisfactory by the average user. The specification is so rigid that at the request of the Fuel Administration it was discontinued during the war to aid in the conservation of gasoline. It was, however, resumed shortly after the signing of the armistice. This specification undoubtedly insures the marketing of a grade of gasoline that behaves satisfactorily in motors, but the requirements are considerably more strict than is necessary and are directly opposed to the conservation of motor fuel.

The South Dakota law is the only one that recognizes the difference in gravity of gasoline refined from different types of crude petroleum. The differences allowed are liberal enough to take care of actual variations in gravity of gasoline produced from different sources. Distillation requirements are, however, too rigid for present conditions and if universally enforced would result in a marked restriction of gasoline production.

The Wyoming law is even more rigid than that in effect in South Carolina. Gasoline meeting its requirements must be a "high-test product" and would normally sell at a price ranging from 3 to 5 cents per gallon higher than the figure for usual grades of gasoline.

LEGISLATION SHOULD BE UNIFORM.

A review of the State laws regulating the quality of gasoline discloses that scarcely any two are alike. If the laws were actually enforced it would mean that companies marketing in more than one of the States included in the list would have to manufacture special grades for each State or else make a single product that would meet the most rigid specification enforced in its marketing territory. Either plan would restrict production and increase the cost to consumers. As a remedy for the present undesirable situation, M. L. Requa, director of the Oil Division of the United States Fuel Administration, suggested to governors of the various States that a uniform specification for gasoline be adopted. He proposed the specification¹⁷ in use by the Government departments at that time (February, 1919), which is variously known as the "Navy specification" or the "Specification for motor transport gasoline." The distillation requirements of the specification are as follows:

- (a) Initial boiling point not higher than 60° C. (140° F.).
- (b) Twenty per cent of the sample must distill below 105° C. (221° F.).
- (c) Forty-five per cent must distill below 135° C. (275° F.).
- (d) Ninety per cent must distill below 180° C. (356° F.).
- (e) The end or dry point of distillation must not be higher than 220° C. (428° F.).
- (f) Not less than 95 per cent of the liquid shall be recovered from the distillation.

The apparatus and method of conducting the distillation test shall be that described in the Bureau of Mines Technical Paper 166, Motor Gasoline, by E. W. Dean.

This specification was officially adopted October 2, 1918, by the Federal committee on standardization of petroleum specifications, M. L. Requa, chairman. The specification had been in force for the purchase of gasoline for military purposes for several months before that time, and practically all motor gasoline used by our own forces and those of our allies was bought in accordance with it. The committee that approved this specification was familiar with the

¹⁷ Report of the Committee on Standardization of Petroleum Specifications, U. S. Fuel Administration, Bull. 1, 1918, 11 pp.

needs of the user and with conditions in the petroleum industry; the limitations adopted were believed to insure a satisfactory quality of motor fuel without seriously restricting production. Since adopting the specification the committee has realized that it was not entirely in accord with the average refinery practice and certain changes were adopted November 25, 1919. Detailed discussion of this matter appears in chapter 2 of the present bulletin.

As a result of suggestions made by Mr. Requa, at least three States—Nebraska, Texas, and Florida—have adopted the motor transport specification and others have taken it under consideration. The city of Los Angeles, Calif., had previously adopted it. In some State legislatures bills were introduced advocating the adoption of this specification, but adding certain gravity requirements that would make it noneffective. For instance, a bill was introduced in the California Legislature advocating specifications as recommended by the Bureau of Mines, but with the additional requirement that all products sold as gasoline in the State of California should have a gravity not lower than 60° B. This requirement would discriminate against practically all the gasoline sold in that State, because on account of its chemical character California crude yields derivatives of relatively low Baumé gravity as compared with those from Mid-Continent and Eastern crudes. The Fuel Administration, in recommending the adoption of the Government specification, believed that it would be accepted without change, or if changes were necessary that they would tend to provide a more lenient specification.

RECOMMENDATIONS AS TO STATE AND MUNICIPAL SPECIFICATIONS.

The Bureau of Mines believes that State and municipal specifications controlling the quality of gasoline are of doubtful necessity at present. As a rule, the demands and complaints of consumers tend to insure the marketing of as satisfactory a grade of gasoline as can be produced in accord with general economic requirements. However, conditions of supply and demand for gasoline have changed rapidly at times in the past, and at some future time, possibly, conditions in the gasoline market may become such that State and municipal specifications will prove of value.

One type of specification which might be of value now, but would be of little use in the future if the quality of motor fuel changes as rapidly as it has changed in the past, would be one discriminating against gasoline containing kerosene or other high-boiling petroleum fractions. However, little evidence is at hand that gasoline of this type, which may be correctly described as adulterated, is being marketed. Of a total of about 1,100 samples of motor gasoline that had been examined by the Bureau of Mines very few contained

kerosene, and most of these were blends of kerosene and casing-head gasoline which, though not satisfactory as motor fuel, would satisfy the usual gravity requirements and even a requirement based on average boiling point. The marketing of gasoline containing kerosene could be successfully prevented by requiring a maximum end point or dry point of 480° F.

The bureau recommends that a State or municipal government, before adopting any act or regulation controlling the quality of gasoline, obtain definite information as to whether the State or municipality will be benefited by legislative control. If legislation is adopted, the bureau recommends that the standard of quality be that given in the latest specification for motor gasoline for Federal purchases. The Federal Government is in a position to study all the aspects of the gasoline situation and its specifications are the results of such study. The specifications must, of course, be altered from time to time as the supply of crude oil changes and as the development of the automotive industry warrants. Therefore, provision should be made for changes in State specifications whenever the Federal specification is modified at any future date because of changed conditions. The present Federal specification, adopted November 25, 1919, was drawn up by the Committee on Standardization of Petroleum Specifications after a careful study of the probable effects of the specification on the available supply of gasoline. The surveys made by the Bureau of Mines have shown conclusively that the quality of gasoline marketed throughout the United States varies widely; in the interest of the consumer these variations should be reduced as much as possible. Accordingly, the committee on standardization adopted a specification for gasoline which if adopted throughout the country would provide satisfactory motor gasoline without unnecessarily restricting the production. This specification as adopted was thought to be liberal enough to prevent undue restriction of production during the next two years.

The present committee was appointed by the President to serve during the war and for six months thereafter. It is hoped that before revision of the present specification for gasoline becomes necessary this committee will be made permanent or some other Federal body will be provided to draw up specifications and consider all questions in regard to them.

CHAPTER 2.—GASOLINE SURVEY OF 1919.

SURVEY NECESSARY FOR REVISION OF GOVERNMENT GASOLINE SPECIFICATIONS.

On October 2, 1918, the Committee on Standardization of Petroleum Specifications adopted the Navy specification for motor gasoline. This specification had already been in use by the War and Navy Departments for several months, and its official adoption by the committee extended its use to all Government purchases of gasoline. Before that time several of the Government departments, such as the Post Office Department, Panama Canal, General Supply Committee of the District of Columbia, etc., had specifications of their own, all of which were somewhat more rigid than that used by the War and Navy Departments.

The specification was first adopted by the Navy Department in 1917, and calls for a grade of gasoline equivalent to the average of a large proportion of motor gasoline marketed during that year. During the time that elapsed before the specification was officially approved by the committee the quality of gasoline sold for domestic consumption had been changed to a certain extent, and even at the time the committee adopted the specification some complaints had been received regarding its strictness. However, as this grade of gasoline could be readily obtained in the domestic market, and as the primary consideration at that time was the needs of the Army and Navy, the committee did not deem it advisable to modify the specification in the direction of greater leniency.

Early in 1919 numerous complaints regarding the specification were received; apparently, general refinery practice had so changed that it was necessary to produce a special grade of gasoline for Government requirements, particularly as regards the limit on the 90 per cent distillation mark. Several departments stated that they were encountering difficulty in obtaining supplies of gasoline that satisfied the specification.

The United States Railroad Administration reported that in many places, particularly isolated towns, buying the grade of gasoline ordinarily marketed in that territory was desirable and even necessary. Distributing companies did not carry a grade corresponding to that specified by the Government and the amounts purchased by the Railroad Administration were not sufficient to warrant the shipping and storage of special gasoline. The War Department also

found it necessary at times to accept shipments that were not up to specifications. A large number of samples submitted to the Post Office Department in connection with bids for a three-months' supply in various cities did not meet requirements. All of these cases indicated the advisability of changing the specification, because in order to render it effective the Government would often be obliged to pay excessive prices for motor gasoline.

The Bureau of Mines was planning a limited survey of the gasoline situation throughout the country in order to obtain figures comparable with those of the 1917 survey, and to obtain data on which to base advice regarding State specifications and conservation measures. The committee on specifications recommended that this survey be made more extensive and that samples be collected from enough cities and companies throughout the country to show conclusively the quality of gasoline being marketed at the time. The committee believed that such information would be of immense value in showing whether a real necessity existed for revising specifications and the magnitude of any changes that seemed desirable.

COLLECTION OF SAMPLES.

A total of 851 samples was collected by the bureau during the spring of 1919. Samples were obtained from every State in the Union except Nevada and from all important marketing companies. Samples of products made by practically all refiners in the country are included in the list. Those refineries not marketing directly were reached through the collection of samples from 124 jobbing companies. An effort was made to obtain samples from the largest cities in each State and to obtain a satisfactorily large number from the more important companies marketing in each section. It is believed that the number of samples collected is adequate to show beyond question the quality of gasoline marketed in each district and in the country as a whole.

An attempt was made to collect samples from all parts of the country at practically the same time. This was advisable on account of the desirability of avoiding, wherever possible, changes that might develop in the quality of gasoline during the progress of the survey, as during the last few years changes have been made so frequently that the gasoline sold in May in a certain city might be entirely different from the gasoline sold there by the same company in July. As a large number of the samples obtained in the 1917 survey were collected in April of that year, it was planned to collect the samples for the 1919 survey during the month of April. Because of delayed replies from some of the organizations requested to cooperate, this was not accomplished, but all the more important marketing points

were covered in April and the rest of the samples were obtained not later than the middle of May. The analysis of the samples failed to indicate any noteworthy changes in quality over this period of approximately six weeks, so that the slight tardiness in completing the sampling campaign caused no difficulty.

A possible objection to the collection of samples during the spring months is that some companies market different grades of gasoline in the summer and winter, the latter grade containing a higher content of volatile material than is considered necessary for use in warm weather. During the month of April some of the gasoline might be the so-called winter grade, some the summer grade. The analytical results fail, however, to show any important differences of this sort. The more northern States should obviously receive winter grade gasoline longer in the spring than southern States. However, it was found that no important differences existed in the grades of gasoline sold by the same companies in southern States and those sold as far north as Maine, with the possible exception of samples having a high content of casing-head gasoline that were obtained from the State of Minnesota. The seasonal differences in the quality of gasoline were insignificant in comparison with other differences which are discussed herein.

METHODS USED IN COLLECTING SAMPLES.

Men from the petroleum division of the Bureau of Mines, who were sent from the Washington office and the Pittsburgh and Bartlesville stations, covered practically all the territory east of the Mississippi, also the States of Missouri, Kansas, Oklahoma, Louisiana, and Texas. Other field stations of the bureau collected samples in the cities where they are situated; for instance, San Francisco, Salt Lake City, Seattle, Denver, and Minneapolis. All of these samples were collected during the month of April and covered practically every large city in the country. The rest of the samples were collected through the cooperation of various universities and chambers of commerce. These samples were chiefly from States not canvassed by bureau men—for instance, New Mexico, North and South Dakota, Iowa, Nebraska, Montana, Idaho, Wyoming, and Oregon; samples were also collected by outside organizations in some of the States where only one city was canvassed by bureau representatives. Practically every organization asked to aid in this survey was anxious to cooperate and furnished valuable aid in carrying on the work. These organizations collected samples from several cities that would not otherwise have been represented, some of these cities being important marketing points.

Most of the samples were obtained from service pumps at garages and retail stations. This method of sampling was adopted so that

the gasoline obtained would be that actually received by the consumer and subject to the same possibility of deterioration or adulteration that the consumer might encounter. Where the gasoline marketed by certain companies could not be obtained at retail stations, the samples were taken at distributing stations. In some instances samples of gasoline marketed by the same company were collected from both retail stations and distributing stations. In each city canvassed an attempt was made to obtain samples of every grade of gasoline sold by every company marketing in the city; to do this it was not necessary to collect samples from every retail station but only from those stations handling grades of gasoline sold by different refiners or jobbers. In some cities only two companies were marketing, whereas in others there were as high as 8 or 10. Doubtless some companies have been overlooked, but it is believed that the samples collected are representative of at least 95 per cent of the gasoline sold in each city. Often samples of the product sold by one marketing company were collected from two or more retail stations.

No attempt was made to confine the collection of samples to any one type of retail station. Wherever possible, samples were taken from stations selling large quantities of gasoline rather than from ones dispensing a few gallons daily. Occasionally samples were collected from small grocery stores operating single pumps where sales did not average more than 5 or 10 gallons a day. Frequently where marketing companies operated their own filling stations one sample was taken from the filling station and one from a garage handling the same brand of gasoline.

Samples were taken directly from the gasoline pump, usually from the hose used for filling the supply tanks of automobiles. The men collecting samples were instructed to secure them, whenever possible, immediately after a customer had been supplied in order to make certain that the sample was representative of the gasoline contained in the storage tank, and had not lost some of its volatile constituents by standing in the pump or gasoline hose. Samples obtained from distributing stations, were, when possible, drawn from tank wagons or from stock tanks from which wagons were being filled.

DATA OBTAINED AT TIME OF COLLECTING SAMPLES.

The men collecting samples were furnished notebook sheets on which were blank spaces for recording the following information regarding each sample:

Date of collection; sample number; city or town; kind of station from which sample was collected (whether filling station, garage, service station, distributing station, or refinery); name of retailer,

street address; name of refiner or jobber supplying gasoline: Retail price; tank-wagon price; name of collector; and remarks. Under remarks was included any additional information regarding the gasoline in question, such as trade name, gravity ratings, whether or not it contained benzol, etc. This information has been filed for use in planning future surveys and in answering questions regarding any particular sample collected.

DESCRIPTION OF CONTAINERS.

The containers used for collecting the samples were half-pint tin cans with slotted screw tops. This type of can is one largely used in the trade as a container for metal polish and sells at a very reasonable figure. (Cans purchased in 1919 by the bureau cost approximately $4\frac{1}{2}$ cents apiece in lots of 500.) The cans are about $2\frac{1}{2}$ inches in diameter, $4\frac{1}{2}$ inches high over all, and have screw tops fitted with fiber gaskets. By inserting a stiff flat strip of metal in the slots of the cap the latter can be screwed on so tightly that there is no danger of loss even when the can is inverted. This type of container has been used by the bureau for several years for collecting and shipping samples of gasoline, and has proven more satisfactory than glass bottles or other types of containers with which the bureau has had experience. Cans when filled with 250 c.c. of gasoline are large enough to allow a satisfactory volume for expansion. A 250-c.c. sample is sufficiently large for making all necessary tests but does not, however, permit the making of tests in duplicate, provided the copper-dish evaporation test is included in the list.

METHOD OF SHIPPING.

The containers were shipped in wooden boxes equipped with screwed-on lids. Three sizes of boxes were used, to contain, respectively, 6, 9, and 12 cans. Boxes containing sufficient cans for the number of samples desired from each city were mailed to the collector at that point. After the cans were filled the boxes were returned to the Bureau of Mines laboratory by express. This method of collecting and shipping samples has proved very satisfactory, as it obviates the necessity of collectors transporting large numbers of sample cans and is in accord with the rules of both the Post Office Department and the express companies.

The rules governing shipment of gasoline by express are given in paragraphs 36 to 39, inclusive, of "Rules for the Transportation of Explosives and Other Dangerous Articles by Express," issued by the Interstate Commerce Commission. These regulations permit the shipment of gasoline by express, provided the amount packed in one outside container does not exceed 1 gallon and provided a red

label is pasted on the outside of the package. The containers must be either tightly closed metal cans or well-stoppered glass or earthenware vessels and must be inclosed in a wooden box. A vacant space of at least 2 per cent of the capacity of each container must be allowed to take care of expansion.

METHODS USED IN TESTING SAMPLES.

The samples were tested in accordance with the methods of testing described in Bureau of Mines Technical Paper 214.¹ Most of these methods of testing are in general use, but for the convenience of the reader they are outlined briefly in the following paragraphs:

COLOR.

Color was determined by comparing a 100-c.c. graduate filled with the gasoline against a similar graduate filled with distilled water, and reported as water white, slightly yellowish, yellowish, etc. This test was undoubtedly too rigid, as gasoline is rarely strictly water white. However, the test furnished a quick method of determining whether or not a gasoline is off color, and as color is of little importance it was not deemed necessary to make use of a tintometer.

In this connection, it may be stated that the color of gasoline is of importance only as an index of care in refining. Color is not even a particularly reliable index of this factor, as there are great possibilities in the handling and storage of gasoline for pollution sufficient to affect the color although not the actual usefulness of the gasoline.

ODOR.

As the odor of gasoline is of little practical importance, unless it is so bad as to be disagreeable to users, no attempt was made to determine this property in any way, other than by the impression made on the observer. Inasmuch as different observers do not agree on good and bad odors of gasoline, very little weight has been given these tests other than for the detection of cracked products and of benzol.

ACIDITY.

During the past year several controversies have arisen on the method of determining the acidity of gasoline. The old method of shaking the original sample with water and testing the water extract with an indicator proved to be practically useless, as it did not detect acid that was chemically combined with the gasoline. In Government specifications for airplane gasolines the acidity test was changed

¹ Dean, E. W., Motor gasoline properties, methods of testing and practical specifications: Tech. Paper 214, Bureau of Mines, 1919, 33 pp. (A revised edition of Technical Paper 166.)

from testing the water extract of the original gasoline to testing the water extract of the residue in the flask after the distillation was completed. The latter test served to detect the presence of acid in gasoline samples that gave a negative test by the former method.

In order to obtain information as to the best method of conducting the test for acidity, the residue in the flask after each distillation was tested as follows: The residue was poured into a test tube and shaken with about 3 c. c. of distilled water. After the oil and water had separated the water extract was drawn off with a pipette and apportioned into three test tubes.

To the contents of the first test tube 2 drops of methyl orange indicator was added. The color produced was compared with three standards, made up as follows:

No. 1. 1 c. c. of distilled water and 2 drops of methyl orange indicator.

No. 2. 1 c. c. of distilled water, 2 drops of indicator, and 1 drop of N/100 acid solution.

No. 3. 1 c. c. of distilled water, 2 drops of indicator, and 1 drop of N/100 alkali solution.

The methyl orange indicator was of such strength that when 1 drop of N/100 acid solution was added to 1 c. c. of distilled water containing 2 drops of the indicator, a slight pink color would appear. Samples which gave an acid reaction with methyl orange as an indicator, the color of the solution corresponding to standard No. 2, were reported as positive (+); the neutral samples, corresponding to standard No. 1, were reported as negative (-). None of the samples gave an alkaline reaction.

A strip of blue litmus was placed on a piece of filter paper; a few drops of the liquid in the second test tube were poured on the test paper, and the change in color observed. The test was reported as (+) if the sample gave an acid reaction and (-) if the color of the paper was not changed.

To the contents of the third test tube 2 drops of phenolphthalein solution were added; then N/100 sodium hydroxide solution was added drop by drop until a pink color appeared. Results were expressed in number of drops of N/100 alkali solution necessary to produce the pink coloration.

UNSATURATION.

The content of unsaturated hydrocarbons in the samples analyzed is expressed in percentages absorbed by 2 volumes of cold concentrated sulphuric acid (specific gravity about 1.84). This test consists of treating 5 c. c. of gasoline with 10 c. c. of sulphuric acid in Babcock bottles, centrifuging, and noting the percentage of gasoline

absorbed by the acid. Details of this test are given in another publication of the bureau.²

"DOCTOR" TEST.

The "doctor" test is used for detecting the presence of certain decomposable sulphur compounds, and is conducted in the following manner: 10 c. c. of gasoline and 5 c. c. of the "doctor" solution (a solution of litharge in caustic soda) are shaken together for about 15 seconds and a pinch of flowers of sulphur is added. If the gasoline is discolored, or the sulphur film is so dark that its yellow color is masked, the test is reported as positive (+) and the sample considered "sour." If the liquid remains unchanged in color, and if the sulphur film is bright yellow, or only slightly discolored with gray, or flecked with black, the test is reported as negative (-), and the gasoline considered "sweet." Of the samples analyzed from this survey, a number were reported as plus or minus ($\pm$). This was done with samples where the sulphur film was colored orange, or where it was questionable whether the test should be reported as positive or negative.

CORROSION AND GUMMING TEST.

This test is used for detecting the presence of corrosive constituents (probably, in most gasoline, elementary sulphur) and gum-forming products, and was developed (by chemists of the Atlantic Refining Co.) for use in testing airplane gasolines. One hundred c. c. of the gasoline is measured into a freshly polished hemispherical copper dish (approximately $3\frac{1}{2}$ inches in diameter) and is evaporated to dryness or until the residue is practically constant on a steam bath. The dish is weighed before the gasoline is added and after the evaporation has been completed, the difference in weight giving the amount of residue from 100 c. c. of gasoline. The nature of the deposit is also recorded. If the dish is corroded, a black or gray deposit will be formed, proving the presence of sulphur, and if gum-forming constituents are present the bottom of the dish will be covered by a varnishlike material. Results are reported as follows: "Bad corrosion," where there is a heavy deposit of gray or black material; "slight corrosion," where there is only a slight deposit of gray or black material; "peacock colored," where there is practically no corrosion, but the copper dish has an iridescent color (airplane gasolines were considered as passing the test if the dish was peacock colored); "no corrosion," where the dish remains perfectly bright; "gum," where the varnishlike deposit is formed either with or without indication of corrosion; and "oil," where a liquid remains in the dish that does not evaporate after the dish has been left on the

² Dean, E. W., and Hill, H. H., Determination of unsaturated hydrocarbons in gasoline, Tech. paper 181, Bureau of Mines, 1919, 25 pp.

steam bath for several hours and has reached practically constant weight.

SPECIFIC GRAVITY.

The specific gravity at 15° C. was determined by means of a Westphal balance. The specific gravity of the samples was converted into degrees Baumé by use of tables published in Circular 57 of the Bureau of Standards.³ The Baumé scale used in these tables is based on a modulus of 140 and is slightly different (the difference for the range 50° B. to 60° B. is 0.4 to 0.5° B.) from the scale largely used in the petroleum industry, which has a modulus of 141.5.

DISTILLATIONS.

Distillation tests were made in accordance with the method described in Technical Paper 214.⁴ In addition to the usual points taken, the temperature at which 5 per cent, 45 per cent, 95 per cent, and 96 per cent distilled were recorded. This was for the purpose of furnishing information to the committee on specifications, regarding points not usually determined. The method of conducting the distillation and the apparatus used have been standardized and are in general use. The method of making the test is briefly as follows: 100 c. c. of gasoline is measured into an Engler flask from a 100 c. c. graduate, and the wet graduate is placed at the bottom of the condenser tube to receive the distillate. Heat is applied to the flask, the rate of heating being so regulated that after the distillation is started the rate is approximately two drops per second. The thermometer is read when the first drop falls from the condenser, this temperature being recorded as the initial boiling point. The temperatures are taken when each 10 per cent is recovered in the receiver. The dry point is taken as the highest temperature reached by the thermometer, and is attained after the bottom of the flask has boiled dry.

The residue in the flask is measured in a graduated test tube and retained for conducting the test for acidity. The sum of the volume of residue (c. c.) and the volume of the liquid (c. c.) in the receiving graduate, subtracted from 100 gives the "distillation loss." The average boiling point is calculated by adding the temperature of the initial boiling point, dry point, and each of the 10 per cent marks, and dividing the sum by 11.

PRESENTATION OF RESULTS OF TESTS.

The detailed results of the laboratory tests made on the 851 samples collected in 1919 are given in Tables 15 and 16, at the end of this bulletin.

³ United States Standard Tables for Petroleum Oils. Bureau of Standards, Circular 57, 1916, p. 64.

⁴ Dean, E. W., Motor gasoline; properties, laboratory methods of testing, and practical specifications. (Revision of Technical Paper 166.) Bureau of Mines, 1919, pp. 18-24.

In order to show the distinction between the gasolines marketed in different States and by the various companies, the data relating to certain tests have been repeated. Table 15 gives data relating to the marketing practices employed in different sections of the country and is arranged with the samples grouped for various States. Table 16 gives tests which show differences in refining practices and is arranged with samples grouped for the different refining companies. The sample numbers and company numbers are the same in both tables, so by choosing a certain sample number and company number in one table the remaining data relating to that sample can easily be found in the other table. It would be impossible to print all the data relating to each sample in one table, unless folded sheets were used. As a division of the table was necessary, the writers believed that the best division would be one showing the differences in price and volatility of gasolines marketed in the various States, and the differences in gasoline made by the various companies as shown by certain laboratory tests.

DISCUSSION OF RESULTS OF SURVEY ARRANGED ON A BASIS OF GEOGRAPHIC ORIGIN OF SAMPLES.

Table 15 (pp. 114-189) includes complete data for the 1919 gasoline survey, the information regarding the various samples being grouped according to geographic point of collection. Samples are grouped under States as main divisions of classification and cities as subdivisions.

The list unfortunately does not include any samples from Nevada, but it is safe to assume that the quality of gasoline sold in that State is equivalent to that sold in California, as the same companies market in both States. This assumption is supported by the fact that the samples of gasoline collected in the 1917 survey were the same for the two States, the only noticeable difference being that prices were higher in Nevada. This was to be expected, because of costs of transportation.

The number of samples collected in each State is roughly proportional to the consumption of gasoline in that State. New York heads the list with 50 samples, whereas States such as Idaho, Wyoming, and New Mexico, where consumption is relatively low, are represented by only a few samples. The relation between number of samples and consumption per State does not hold strictly and there are several noteworthy exceptions, such as South Dakota and Oklahoma. In general, however, the collection of samples was balanced against consumption with enough accuracy to make the survey representative of the average quality of gasoline sold.

DESIGNATION OF REFINING COMPANIES BY NUMBER RATHER THAN BY NAME.

The policy of the Bureau of Mines is not to publish scientific information in such form as to be extensively used for advertising purposes or to disclose the source of confidential information. Therefore the names of companies producing the various samples of gasoline examined in the bureau surveys can not be published here. However, as the noting of similarities or differences in the refining practice of various companies is important, the refining companies have been designated by numbers in connection with each sample. The bureau recognizes the possibility of names of companies being discovered through scrutiny of the tables and text. It is not believed, however, that this would cause any injury to the various companies, as their products are usually subject to careful examination by competitors, and in any event the results of the present bulletin can not, with the official approval of the bureau, be quoted for advertising purposes.

The numbers assigned to various refining companies are the same for both the 1917 and 1919 surveys. As regards samples where the refining company producing the sample could not be identified, the company number represents the jobber handling the gasoline. The list of samples includes a total of 257 refining and jobbing concerns. A number of small refiners not represented directly were reached through these jobbing companies which handle the bulk of their production.

TERMINOLOGY EMPLOYED IN RECORDING SOURCE OF SAMPLES.

The terms used to designate the sources from which samples were collected were selected by the bureau as a satisfactory scheme of differentiation. It seems advisable to define these terms as some of them may not be generally familiar to the public.

The term "filling station" is given to that type of retail station that handles gasoline and lubricating oils exclusively. Such stations are sometimes operated by refining or marketing companies and sometimes by private individuals. In the cities in which they are operated they sell a relatively large proportion of the gasoline sold and usually sell at a lower price than any other type of retail station.

The term "service station" is applied to stores handling such materials as automobile accessories, hardware, and groceries, with gasoline as a side line. These concerns may have one or more gasoline pumps, but usually sell at the same price as filling stations and in some cities market a large proportion of the gasoline sold. The distinction between "service stations" and "filling stations" is not absolutely definite, and it is possible that the collectors of the bureau samples failed sometimes to classify the stations properly. Possible errors of this sort are, however, without particular importance.

The term "distributing station" is applied to the wholesale station of the jobbing or marketing company. Gasoline is shipped to these stations from the refineries, and is then sent out to retail stations in tank wagons or steel drums. Different brands and grades of gasoline are frequently blended at these distributing stations.

VARIATIONS IN RETAIL PRICE OF SAMPLES COLLECTED IN THE 1919 SURVEY.

The retail price of gasoline in each city was found to be subject to variation, which is controlled particularly by the nature of the retailing station. Garages and small service stations sometimes sell at prices as much as 3 cents per gallon higher than those maintained by the large filling stations. In the Middle Western States this is largely due to the fact that the larger filling stations sell gasoline at the tank wagon or wholesale price, thereby preventing the smaller retailers from obtaining any profit if they try to compete with the figures of the large filling station. Some retailers claim that gasoline can not be handled profitably even with a margin of 2 or 3 cents a gallon on account of the cost of handling and losses incident to storage and handling. As a result much of the gasoline sold by garages in particular is for the convenience of customers who demand this particular service in connection with other more profitable activities for the garage proprietor.

In certain other sections of the country where the tank wagon or wholesale price differs from the usual retail price a larger proportion of gasoline is handled by garages that frequently market at the same price as the filling stations. On account of these appreciable and irregular variations in retail prices the discussion in the present bulletin is based on the average filling station price for each city rather than on the average of all the prices of samples. In practically all instances these filling station prices represent the price at which the bulk of the gasoline is sold in each city. They do not necessarily represent the lowest retail price in each city, as occasionally some retail stations sell at figures below the generally accepted price. The amount of gasoline dispensed in this way is, however, too small to merit consideration.

The highest retail price for any gasoline represented in the 1919 survey was 68 cents per gallon and the lowest price $13\frac{1}{2}$ cents per gallon. Neither of these fuels, however, is representative of the type ordinarily used in automobiles, one being an aviation gasoline, the other a so-called engine distillate which is sold to a certain extent on the Pacific coast for use in trucks. For the normal grades of gasoline the lowest retail price of the present series was $20\frac{1}{2}$ cents for the city of San Francisco, Calif., and the highest (filling station) price, 32 cents per gallon in Albuquerque, N. Mex. The average wholesale and retail prices of gasoline for the larger cities represented by the

1919 survey appear in Table 4 (p. 26). Each State with the exception of Montana and Mississippi is represented by the cities that, according to the Census of 1910, are the largest in the State. In a few States, such as South Carolina, Virginia, Tennessee, and West Virginia, the price general in cities other than the one selected was 1 or 2 cents a gallon cheaper, but as a rule the prices listed represent the figure at which the bulk of the gasoline is sold.

The reader will note that fairly uniform prices are maintained throughout each of several general sections of the country, and that the price variations of these different sections are not considerable, especially if account is taken of transportation costs.

DISCUSSION OF GRAVITIES OF SAMPLES COLLECTED IN THE 1919 SURVEY.

GRAVITY OF SAMPLES CONTAINING COAL-TAR DISTILLATES.

The figures for gravities of the samples collected in the 1919 survey furnish definite evidence of the inadequacy of this property as an index of the quality of gasoline. Gravities of samples tested vary between the limits of 30.6° to 75.3° B. (specific gravities, 0.872 to 0.682), which according to the older interpretation of the gravity test would indicate that some of the products belonged to the class of fuel oil. The fuels of low Baumé gravity, however, consist largely of benzol and other coal-tar products that are as volatile as gasoline. None of the samples of gasoline contained constituents boiling at as high temperatures as would be indicated by the gravity figures in the neighborhood of 30° B. In fact, the chief use of the gravity measurements was the indication they furnished of the presence of coal-tar distillates.

The most serviceable method known to the bureau for determining the content of coal-tar distillates (so-called aromatic hydrocarbons) depends on a knowledge of the two properties of volatility and specific gravity. A detailed description of one of the methods devised for this purpose has been written by Thole.⁵

GRAVITY OF SAMPLES FROM DIFFERENT TYPES OF CRUDE OIL.

In addition to the wide difference in gravity due to the presence of benzol and other derivatives of the distillation of coal, there is also a decided difference due to the nature of the crude petroleum from which the gasolines were derived. Gasolines refined from California crude are heavier (of lower Baumé gravity) than products of the same volatility range obtained from Mid-Continent crude. The latter in turn are heavier than distillates of equivalent volatility derived from Pennsylvania crude. The extent of these differences is illustrated by figures in Table 5, which show the gravities and dis-

⁵ Thole, F. B. The estimation of benzene and toluene in petroleum, Jour. Soc. Chem. Ind., vol. 38, Feb., 1919, pp.39-43t.

TABLE 5.—Data showing difference in gravity of gasoline due to nature of crude from which obtained.
A. SAME VOLATILITY; DIFFERENT GRAVITIES.

Sam- ple No.	Crude.	Com- pany No.	City.	State.	Spe- cific grav- ity.	De- grees Baumé.	Distillation. ¹										Aver- age boil- ing point.
							10 cent.	20 per cent.	30 per cent.	40 cent.	50 per cent.	60 per cent.	70 per cent.	80 per cent.	90 per cent.	95 per cent.	Dry point.
271	California.....	13	Tucson.....	Arizona.....	0.762	53.7	{ 140 60	{ 203 87	{ 216 102	{ 230 110	{ 241 116	{ 252 122	{ 266 130	{ 284 140	{ 309 154	{ 334 168	{ 352 178
538	Pennsylvania.....	83	Portland.....	Maine.....	.722	63.9	{ 149 65	{ 190 88	{ 216 102	{ 226 108	{ 239 115	{ 252 122	{ 264 129	{ 282 139	{ 306 152	{ 331 166	{ 360 182
835	Mid-Continent.....	69	Tulsa.....	Oklahoma.....	.736	60.2	{ 135 57	{ 174 79	{ 210 99	{ 225 107	{ 235 113	{ 257 125	{ 273 134	{ 295 146	{ 327 164	{ 358 181	{ 385 196

B. SAME VOLATILITY; DIFFERENT GRAVITIES.

362	Pennsylvania.....	20	Wilmington.....	Delaware.....	0.739	59.4	{ 158 70	{ 205 96	{ 223 106	{ 237 114	{ 252 122	{ 266 130	{ 280 138	{ 297 147	{ 316 158	{ 345 174	{ 381 194	{ 417 214
832	Mid-Continent.....	240	Muskogee.....	Oklahoma.....	.748	57.2	{ 165 74	{ 201 94	{ 217 103	{ 228 109	{ 244 118	{ 257 125	{ 273 134	{ 289 143	{ 311 155	{ 340 171	{ 369 187	{ 397 203
294	California.....	92	Los Angeles.....	California.....	.771	51.6	{ 127 53	{ 199 93	{ 219 104	{ 237 114	{ 250 121	{ 264 129	{ 279 137	{ 289 143	{ 311 155	{ 340 171	{ 374 190	{ 403 206

C. SAME GRAVITIES; DIFFERENT VOLATILITIES.

479	Mid-Continent.....	59	Topeka.....	Kansas.....	0.745	57.9	{ 144 62	{ 199 93	{ 223 106	{ 243 117	{ 255 124	{ 271 133	{ 280 143	{ 307 153	{ 329 165	{ 352 178	{ 381 194	{ 410 210
295	California.....	84	Los Angeles.....	California.....	.746	57.7	{ 131 55	{ 176 80	{ 192 99	{ 210 107	{ 225 115	{ 239 122	{ 252 127	{ 273 134	{ 283 145	{ 325 163	{ 361 183	{ 394 201
691	Pennsylvania.....	20	Newark.....	New Jersey.....	.744	58.2	{ 167 75	{ 216 102	{ 230 110	{ 244 118	{ 257 125	{ 277 136	{ 293 145	{ 313 156	{ 338 170	{ 374 190	{ 394 201	{ 423 217

¹ The upper line of figures for each sample represents Fahrenheit temperatures, the lower line centigrade temperatures. This system has been followed uniformly in all subsequent tables.

tillation ranges of three representative samples produced by the "straight refinery" method from each of the typical crude oils—California, Pennsylvania, and Mid-Continent. The nine samples selected were so chosen as to avoid as far as possible products containing either "casing-head" or "cracked" constituents. Most of the samples were of gasoline made by refineries that were known to obtain their crude petroleum from adjacent producing fields.

Section A of Table 5 shows difference in gravity of samples having both the same distillation range and the same general type of distillation curve, the distillation figures for the California and Pennsylvania samples in particular being practically identical. The sample derived from Oklahoma crude contained slightly higher percentages of both low-boiling and high-boiling fractions, but had practically the same average volatility. The difference in gravity between the California and Oklahoma samples is 6.5° B.; that between the Oklahoma and Pennsylvania samples is 3.7° B.; the difference between California and Pennsylvania samples is the sum of 6.5 and 3.7, or 10.2° B.

Section B of Table 5 shows the differences in gravity of another series of three gasolines derived, respectively, from California, Mid-Continent, and Pennsylvania crude petroleum, these products being of higher average boiling points and more similar to the common type of motor gasoline sold to-day than the three samples represented in section A. In this series the differences are as follows: The California gasoline was 5.6° B. heavier than the Oklahoma sample, the latter was 2.2° B. heavier than the Pennsylvania sample; the California sample was 7.8° B. heavier than the Pennsylvania sample. The Pennsylvania sample had a slightly higher average boiling point than either of the other two, which no doubt accounts for a gravity difference smaller than that noted in section A. The Pennsylvania sample was the best one available for purposes of comparison.

Section C of Table 5 shows a similar comparison between samples of approximately equal gravity but different distillation range. This difference is illustrated also by the curves in figure 9, which show a much greater difference between the gasolines produced from California and Mid-Continent crudes than between those produced from Pennsylvania and Mid-Continent crudes.

On disregarding mixtures containing benzol and other coal-tar distillates, high-test gasolines, and other special fuels, it appears that the gravity of the samples derived from California crude petroleum ranged from 52 to 56° B. (specific gravity, 0.769 to 0.753); those derived from Mid-Continent crude, 55 to 58° B. (specific gravity, 0.757 to 0.745); and those from Pennsylvania crude, 59 to 63° B. (specific gravity, 0.741 to 0.725). The differences in gravity of the average products from each of the three types of crude are less than those discussed in the previous pages, this being due, however, to the fact

that the average volatility of the gasoline made in California is lower than that of gasoline produced in the Mid-Continent and eastern refineries.

GRAVITY OF SAMPLES CONTAINING CRACKED PRODUCTS.

Gasolines containing products of the cracking reactions are characterized by a considerable content of olefine or so-called unsaturated hydrocarbons. Cracked gasoline made by certain types of processes is likely also to contain aromatic hydrocarbons. Olefine hydrocarbons are slightly heavier (of lower Baumé gravity) than paraffins of the same boiling point, but are considerably lighter (of higher Baumé gravity) than the so-called naphthene hydrocarbons that are

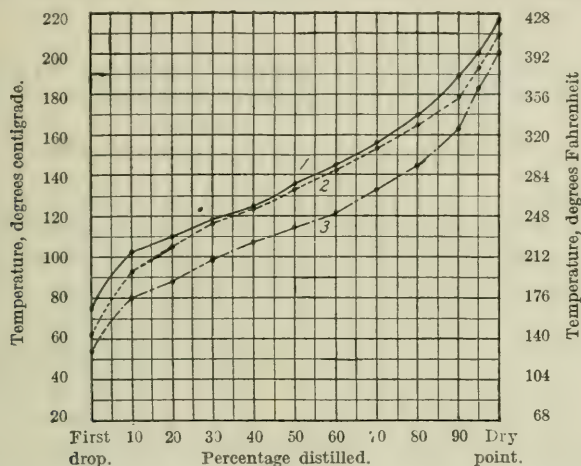


FIGURE 9.—Curves showing differences in distillation range of gasolines of equal gravity derived from Pennsylvania, Mid-Continent, and California crude oil. Curve 1, (sample 691) gasoline from Pennsylvania crude; gravity 58.2° B., average boiling point, 140° C. Curve 2, (sample 479) gasoline from Mid-Continent crude; 57.9° B., 135° C. Curve 3, (sample 295) gasoline from California crude; 57.7° B., 119° C.

present in varying proportions in crude petroleum, occurring chiefly in the California and Gulf coast crudes and to a lesser degree in the Mid-Continent crude. Aromatic hydrocarbons are notably heavier than either naphthenes, olefines, or paraffins, and their presence is indicated, as has already been stated, by noticeably low Baumé gravities for given ranges of volatility.

Practically all the gasolines containing enough unsaturated constituents to indicate that they were derived from cracking processes did not appreciably differ in gravity from uncracked gasolines derived from the same types of crude petroleum. Some of the cracked gasolines that were derived from paraffin or intermediate base crudes were of higher Baumé gravity than uncracked products derived from naphthenic base crudes, such as those of California. One sample of

cracked gasoline in particular is worthy of mention, as the cracking process undoubtedly formed noticeable percentages of aromatic hydrocarbons. This sample (No. 887) was made from Pennsylvania fuel oil by cracking and had a gravity of 56.7° B. (specific gravity, 0.750). Sample 538, a "straight-run" gasoline from Pennsylvania crude, had a distillation curve approximately the same as that of sample 877, but had a gravity of 63.9° B. (specific gravity, 0.722).

Practically all the other samples of gasoline failed, however, to show any characteristic gravity indications; the results clearly demonstrate that measurement of specific gravity, even in addition to distillation tests, fails to indicate the proportion of cracked constituents in gasoline. The only reliable tests for cracked constituents are those which measure degree of unsaturation by chemical methods.

SPECIFIC FEATURES OF VOLATILITY TESTS OF SAMPLES COLLECTED IN THE 1919 SURVEY.

NATURE OF VOLATILITY MEASUREMENTS.

The volatility of gasolines was tested by making the standard analytical distillation according to the method described in Technical Paper 214⁶ and noting the temperatures at which certain amounts were recovered in the receiver. The boiling temperatures were read for the first drop, the 5 per cent mark, each of the 10 per cent marks from 10 per cent to 90 per cent, the 45 per cent mark, 95 per cent mark, 96 per cent mark, and dry point. Of these temperatures, those for the first drop, the 20 per cent, 50 per cent, and 90 per cent marks, and the dry point are sufficient in most samples to indicate the nature of the gasoline and for that reason are given most prominence. The 5 per cent, 45 per cent, 95 per cent, and 96 per cent marks are not usually determined in making gasoline distillates, but were recorded in the present series of tests in order to supply information regarding their usefulness as points on which to base specification requirements.

INITIAL BOILING POINT, OR "FIRST-DROP" TEMPERATURE.

The initial boiling point is taken as the temperature read on the thermometer when the first drop falls from the tip of the condenser. Mention should be made here that this determination is one with which considerable difficulty has been encountered in getting concordant results for analyses made by different operators and in different laboratories. The temperature recorded is subject to decided variation unless operating conditions are carefully standardized.

⁶ Dean, E. W., Motor gasoline; properties, laboratory methods of testing, and practical specifications: Tech. Paper 214, 1919, pp. 18-24.

Recent experiments made by the bureau indicate that reasonably good checks can be obtained if the analyst takes the simple precaution of regulating the initial rate of heating. Excellent checks on initial boiling points were obtained for most tests when the period that elapsed between first turning on the heat and the falling of the first drop was not less than 5 nor more than 10 minutes. Occasionally a drop may fall before the distillation actually begins, on account of the draining of liquid already in the condenser tube after a previous distillation. When this happens, the drop should be disregarded, as the true first drop is always followed closely by a continuous passage of distillate into the receiving graduate.

The initial boiling point of gasoline is a valuable indication of its content of low-boiling constituents and provides an index of its suitability for use in cold weather. A low initial boiling point practically always indicates the presence of casing-head gasoline unless the sample is a high-test straight-run product. The latter type of gasoline is now comparatively rare. Of the samples of the 1919 survey having initial boiling points below 50° C. (122° F.), the majority contained casing-head gasoline in varying proportions.

The practical significance of a low initial boiling point, as regards the starting qualities of gasoline, has not been experimentally studied by the bureau, but the statement is frequently made by men who are known to be reliable observers that a relatively low initial boiling point (something below 60° C. or 140° F.) is essential for easy starting of a cold motor. It is, for instance, stated that there is a noteworthy difference in the starting properties of two gasolines, both of which have the same percentage distilling below the boiling point of water and the same average volatility, but one has an initial boiling point considerably above and the other considerably below 60° C. (140° F.).

Initial boiling points of the samples included in the 1919 series ranged from 27° C. (81° F.) for a mixture of casing-head gasoline and kerosene to 104° C. (219° F.) for a California "engine distillate." Most of the ordinary types of motor gasoline had initial boiling points between 40° and 70° C. (104° and 158° F.), depending on the nature of the crude oil from which the gasoline was derived and whether or not it contained casing-head gasoline. "Straight-run" gasolines of high end point derived from certain crudes, particularly those of Kansas and California, have relatively high initial boiling points, usually above 60° C. (140° F.). Practically all the normal motor gasolines having initial boiling points below 50° C. (122° F.), contained casing-head gasoline in varying proportions. Samples with initial boiling points below 40° C. (104° F.) contained either large percentages of ordinary casing-head gasoline or highly volatile casing-head gasoline (usually described by oil men as "wild").

FIVE PER CENT MARK.

On account of frequently reported difficulties in obtaining satisfactory checks on initial boiling-point measurements, it was at one time believed that the "5 per cent" distillation mark could be used instead of the "first drop" temperature. Some recent experiments of the bureau indicate that the difficulty of checking the 5 per cent mark is as great as that of checking the initial boiling point, and for this reason the data on 5 per cent distillation points has not proved particularly useful. It may be noted, however, that the differences between initial boiling points and 5 per cent marks are, in most of the tests, between the limits of 18° to 22° C. (32 to 40° F.) and the average difference for the whole series is exactly 20° C., or 36° F.

TWENTY PER CENT MARK.

The temperature below which 20 per cent of the gasoline distills is regarded as one of the important points in determining distillation range. This point may be determined with a high degree of experimental accuracy and furnishes a satisfactory index of the proportion of low-boiling constituents in a gasoline.

The 20 per cent mark of a large proportion of the samples of the 1919 survey fall between the limits of 85° to 105° C. (185 to 221° F.), and the average figure was 95° C. (203° F.).

FORTY-FIVE AND FIFTY PER CENT MARKS.

The temperature at which 45 per cent of the gasoline distilled was determined for each of the samples in the 1919 survey because the previously adopted Government specification used this point as one of its limits. This point was originally introduced in the so-called Navy specification for some reason which is not evident, as the usual procedure in making a distillation is to determine the even 10 per cent marks. The 45 per cent mark seems to have no advantages over the more usual 50 per cent mark, hence measurements were made in the present series to establish definitely the temperature difference between these two marks so that later specifications could employ the more convenient 50 per cent limit. It was found that differences between the 45 per cent and 50 per cent marks range between 1° and 13° C., the average difference for the whole series being 6° C. (11° F.). In fact, the use of a specification limit for either 45 or 50 per cent points is not particularly necessary, as the distillation range is usually fixed by the temperature marks for 20 per cent and 90 per cent. The desirable practice in writing specifications is to employ an intermediate limit, but make it so lenient that it serves to discriminate only against samples that show abnormal distillation curves.

NINETY PER CENT MARK.

The 90 per cent mark has been found to be the highest point in the distillation range of gasoline that permits accurate determination in distillation tests as ordinarily conducted in commercial laboratories.

In its own laboratories the bureau has encountered only slight difficulty in obtaining satisfactorily accurate determinations of the dry point, but the experience of various testing laboratories throughout the country has indicated the possibility of decided variation in dry-point measurements. The writers believe that these differences are usually due to not making the determination according to accurately defined methods, although this explanation has not yet been substantiated above question.

The 90 per cent mark, in addition to being satisfactory as regards laboratory analysis, is an important index of the general distillation range of a gasoline and furnishes information which is not readily available by consideration only of the dry point as the upper volatility limit. Gasolines collected in the 1919 survey had 90 per cent points varying over a wide range, the lowest figure being 110° C. (230° F.) and the highest figure 270° C. (518° F.); the average figure was 183° C. (361° F.).

NINETY-FIVE PER CENT MARK.

Measurements of temperature below which 95 per cent of the gasoline distilled were made in order to obtain information regarding the value of this point as an upper distillation limit in specifications. The writers found that this point did not permit satisfactorily accurate determination. It proved to be affected in large degree by relatively slight variations in distillation loss and was also undesirable because it occurs in a part of the distillation curve where the temperature is rising rapidly for small changes in the volume distilled. The figures obtained in the analyses of the series of samples varied so widely and irregularly that no attempt was made to classify the data obtained regarding this mark.

NINETY-SIX PER CENT MARK.

In the specifications originally adopted in October, 1918, by the Committee on Petroleum Specifications, three grades of airplane gasoline were included. At that time some doubt existed regarding the desirability of determining end points by the existing methods, which are discussed later, and the committee believed that for the type of products supplied for airplane use a satisfactory limit would be the temperature below which 96 per cent of the gasoline distilled. The correctness of this assumption was verified by experience of the inspectors of shipments of airplane gasoline, but it was not demonstrated that this limit could be regarded as satisfactory for the more

heterogeneous types of products marketed for domestic consumption in ordinary motors.

In outlining the tests for the 1919 survey, the bureau decided to obtain data regarding the 96 per cent mark and ascertain whether it could be employed instead of any of the other limits for final boiling temperature, its advantage, of course, being the simplicity with which it could be defined and the possible minimum variation among different operators. The results of the tests made by the bureau demonstrated that this limit is not satisfactory for motor gasoline. In a number of analyses the distillation loss was so great that 96 per cent was not recovered. The specification for airplane gasolines applies a maximum limit on the amount of material distilling below 60° C., thereby insuring a grade of gasoline that could be distilled with relatively small distillation loss. Such a limit could not be applied to motor gasoline. In all analyses the temperature at the 96 per cent point is rising so rapidly that an appreciable error in reading is possible. The differences in temperatures read for the 95 per cent and 96 per cent points was usually between 5° and 10° C. (9° and 18° F.), depending to a large extent on the character of the gasoline, and its content of casing-head gasoline, if the latter were present. For most of the samples the difference between the 96 per cent point and the dry point was about the same as the difference between the 95 per cent mark and the 96 per cent mark. In most samples where the distillation loss was approximately 2 per cent, the 96 per cent mark was practically the same as the dry point. When the distillation loss was much in excess of 2 per cent, the percentage of gasoline recovered in the receiving graduate was less than 96, so the mark could not be determined. Therefore, on account of the unsatisfactory nature of this mark as a volatility limit, no discussion of the range and variation of figures obtained for the survey is offered.

DRY POINT.

The methods of procedure and the definitions used by various analysts for determining the dry point of gasoline differ decidedly. Some analysts record the temperature at which the bottom of the flask boils dry; some record the temperature when the last drop falls from the condenser; others record the temperature at which the first puff of white smoke appears in the bulb of the flask; and still others record the temperature at which 98 per cent of the gasoline is recovered in the receiver. The method preferred by the Bureau of Mines is that involving measurement of the highest temperature attained in the distillation.

After the bottom of the flask has boiled practically dry, the temperature of the thermometer generally continues to rise a number of

degrees. A point is finally reached where the mercury column remains constant for an appreciable period of time, after which it starts to recede. This maximum point is easy to read accurately. In some distillations a maximum is reached without the bottom of the flask boiling dry. This may be due to the fact that the source of heat is not intense enough to vaporize a few per cent of material of relatively high boiling point. Such a condition never arises when the gasoline is properly fractionated, but did arise for a few samples of the present series. For these samples a notation is made indicating that a true dry point was not measured and that the figure is simply the highest temperature reached.

The experience of the Bureau of Mines chemists has indicated that dry points can be checked within reasonable limits without particular difficulty if the distillation is conducted according to the method specified for dry-point determination. The principal difficulties are failure to use a hot enough source of heat or the use of a source of heat that permits superheating of the thermometer bulb above the temperature of the current of vapor.

Some of the samples collected in the 1919 survey had dry points as low as 140° C. (284° F.) and as high as 280° C. (536° F.). The average for all samples was 217° C. (423° F.). The majority of samples having end points lower than 400° F. with the exception of products derived from California crude, were so-called "high test" gasoline which are marketed in limited quantities. Products having end points above 450° F. were chiefly blends of casing-head gasoline with either heavy naphtha or kerosene. The majority of samples sold as motor gasoline (exclusive of the products of California refineries) had end points between 410° and 450° F. There were, however, notably consistent variations in samples from certain sections of the country. The average distillation figures for the gasolines marketed in each State appear in Table 6 and illustrate the magnitude of these sectional variations.

AVERAGE BOILING POINT.

In order to study the volatility of gasoline, it is necessary to have figures representing the distillation range. For certain purposes, however, a single figure that represents the general quality of the gasoline is useful. In the past, the custom has been to rate gasolines on the basis of Baumé gravity. This custom originated when practically the only type of crude refined was that from Pennsylvania. When only one type of crude is under consideration a fairly definite relation exists between gravity and volatility, as has been already

TABLE 6.—Data showing average distillation ranges of samples collected in each State in the 1919 survey.

State.	Number of samples.	Distillation. ¹				
		Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.
Alabama.....	15 {	129 54	212 100	266 130	365 185	424 218
Arizona.....	6 {	126 52	207 97	255 124	352 178	412 211
Arkansas.....	12 {	127 53	207 97	271 133	372 189	428 220
California.....	28 {	133 56	205 96	244 118	329 165	392 200
Colorado.....	24 {	126 52	207 97	271 133	381 194	435 224
Connecticut.....	18 {	129 54	208 98	262 128	360 182	415 213
Delaware.....	5 {	129 54	208 94	257 125	354 179	426 219
Florida.....	18 {	124 51	207 97	261 127	356 180	419 215
Georgia.....	17 {	127 53	207 97	259 126	361 183	426 219
Idaho.....	3 {	122 50	203 95	253 123	361 183	421 216
Illinois.....	38 {	120 49	199 93	264 129	374 190	433 223
Indiana.....	15 {	118 48	198 92	262 128	385 196	444 229
Iowa.....	18 {	124 51	207 97	273 134	388 198	439 226
Kansas.....	24 {	135 57	212 100	268 131	372 189	428 220
Kentucky.....	11 {	120 49	203 95	271 133	388 198	444 229
Louisiana.....	20 {	126 52	216 102	270 132	369 187	426 219
Maine.....	11 {	126 52	207 97	262 128	360 182	410 210
Maryland.....	8 {	142 61	210 99	259 126	370 188	433 223
Massachusetts.....	19 {	127 53	205 96	257 125	358 181	412 211
Michigan.....	26 {	117 47	201 94	268 131	378 192	435 224
Minnesota.....	15 {	111 44	189 87	262 128	374 190	415 213
Mississippi.....	6 {	117 47	207 97	261 127	354 179	417 214
Missouri.....	38 {	131 55	207 97	266 130	376 191	432 222
Montana.....	9 {	133 56	212 100	273 134	396 202	453 234
Nebraska.....	13 {	117 47	199 93	266 130	378 192	432 222

¹ For each group of samples the upper line of figures is in Fahrenheit degrees, the lower line is in centigrade degrees.

TABLE 6.—Data showing average distillation ranges of samples collected in each State in the 1919 survey—Continued.

State.	Number of samples.	Distillation.				
		Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.
New Hampshire.....	8	{ 120 49	{ 203 95	{ 261 127	{ 361 183	{ 412 211
New Jersey.....	16	{ 127 53	{ 198 92	{ 253 123	{ 351 177	{ 423 217
New Mexico.....	4	{ 124 51	{ 219 104	{ 268 131	{ 356 180	{ 426 219
New York.....	50	{ 131 55	{ 205 96	{ 255 124	{ 358 181	{ 415 213
North Carolina.....	15	{ 126 52	{ 207 97	{ 262 128	{ 360 182	{ 417 214
North Dakota.....	12	{ 126 52	{ 203 95	{ 289 143	{ 381 194	{ 435 224
Ohio.....	40	{ 120 49	{ 196 91	{ 250 121	{ 351 177	{ 414 212
Oklahoma.....	40	{ 131 55	{ 210 99	{ 266 130	{ 370 188	{ 424 218
Oregon.....	9	{ 115 46	{ 198 92	{ 241 116	{ 325 163	{ 392 200
Pennsylvania.....	37	{ 113 45	{ 190 88	{ 252 122	{ 358 181	{ 408 209
Rhode Island.....	8	{ 120 49	{ 190 88	{ 244 118	{ 354 179	{ 405 207
South Carolina.....	14	{ 131 55	{ 203 95	{ 244 118	{ 333 167	{ 390 199
South Dakota.....	23	{ 127 53	{ 199 93	{ 261 127	{ 367 186	{ 423 217
Tennessee.....	21	{ 126 52	{ 208 98	{ 270 132	{ 378 192	{ 433 223
Texas.....	40	{ 127 53	{ 203 95	{ 253 123	{ 358 181	{ 417 214
Utah.....	8	{ 113 45	{ 207 97	{ 279 137	{ 406 208	{ 442 228
Vermont.....	6	{ 138 59	{ 221 105	{ 271 133	{ 354 179	{ 406 208
Virginia.....	14	{ 122 50	{ 210 99	{ 270 132	{ 370 188	{ 419 215
Washington, D. C.....	5	{ 111 44	{ 190 88	{ 270 132	{ 381 194	{ 426 219
Washington.....	15	{ 133 56	{ 210 99	{ 253 123	{ 334 168	{ 392 200
West Virginia.....	17	{ 106 41	{ 183 84	{ 259 126	{ 396 202	{ 455 235
Wisconsin.....	27	{ 111 44	{ 185 85	{ 244 118	{ 351 177	{ 408 209
Wyoming.....	5	{ 115 46	{ 208 98	{ 289 143	{ 414 212	{ 471 244
Total samples.....	851					
Average distillation.....		{ 126 52	{ 203 95	{ 261 127	{ 361 183	{ 423 217

stated. However, products derived from different types of crude may have different gravities for the same volatility or different volatilities for the same gravity. In the present bulletin use has been made of a figure which is designated as the average boiling point. This figure represents the average of the initial boiling point, the various 10 per cent marks, and the dry point. It gives practically the same sort of an index that one could obtain by gravity measurement, provided the chemical composition of the hydrocarbons in the gasoline was always the same. The reader must recollect, however, that the average boiling point does not take into account the general course of the distillation range. It is, for instance, possible to blend kerosene and casing-head gasoline to yield a certain average boiling point. A straight-run gasoline of the same average boiling point would be of entirely different properties and utility. The bureau has hesitated to make use of this average boiling-point figure for fear it be given too much emphasis. It is, however, useful provided its limitations are recognized, and as has been stated, serves practically the same purpose as the gravity figure for products of known origin.

A large number of samples of the 1919 survey had average boiling points between 125° and 135° C. (257° and 275° F.) the average for the whole series being 130° C. (266° F.).

DISTILLATION LOSS.

In connection with each distillation test a figure is obtained representing the percentage of gasoline lost through failure to condense all vapor. The method as described in Technical Paper 214⁷ requires that when a test shows a distillation loss greater than 2 per cent the sample shall be distilled again to ascertain whether or not the loss is characteristic of the gasoline or is due to excessively rapid heating at the beginning of the distillation.

In distillations where the high loss is duplicated and it is desired to get an accurate distillation curve of the sample the procedure is to rerun, using an ice-salt freezing mixture in the condensing box and immersing the receiving graduate in ice water. This procedure is not usually required and complicates the distillation test to a large degree, especially as allowance has to be made for contraction of the gasoline due to its measurement at a temperature of approximately 32° F.

⁷ Dean, E. W., Motor gasoline; properties, laboratory methods of testing, and practical specifications: Tech. Paper 214, Bureau of Mines, 1919, p. 23.

In the present series of tests the size of the samples did not permit making a duplicate determination when a high distillation loss was obtained. For the purposes of this discussion the loss is assumed to be characteristic of the gasoline rather than due to carelessness of the operator; this is not strictly true, of course, but undoubtedly holds for the majority of gasolines tested. A confirmed high distillation loss indicates that the gasoline has an appreciable content of constituents which can not be readily condensed at the temperature of 36° to 38° F, usually maintained in the condenser. Therefore, as a rule, blended casing-head gasoline will be characterized by a high distillation loss. Hence this character is a useful index of the presence of casing-head gasoline, but the analyst must remember that high distillation loss affects the accuracy of most of the points in the distillation curve. The loss represents low-boiling fractions and is not divided among fractions throughout the entire course of the distillation. In consequence, each of the apparent percentage points is actually higher by the amount of the distillation loss. For example, sample 892 showed a distillation loss of 4 per cent; its apparent 90 per cent mark was 200° C.; and its 95 per cent mark 223° C. In actual fact, 200° C. was the 94 per cent mark and 223° C. the 99 per cent mark. On the basis of the general course of the distillation curve, it is estimated that the true 90 per cent mark was about 195° C. and the true 95 per cent mark about 215° C. The dry point was not affected by the distillation loss. The temperatures recorded for the other marks below 90 per cent were also high.

This discrepancy has been brought to the bureau's attention by several organizations, with the suggestion that the distillation figures in the analysis of gasoline should always be corrected for recovery loss. The bureau has not favored this correction, as it introduces complications that are not believed to be worth the trouble they will cause. In the event of dispute the desirable procedure is to regulate conditions of operation so that a loss not exceeding 2 per cent will be obtained. Gasoline that can not be distilled with this maximum loss when an ice-salt mixture is used in the condenser box undoubtedly contains an excessively large content of very volatile casing-head gasoline and does not deserve the benefit of the corrections which could be introduced to allow for distillation loss.

As has already been stated, the discrepancies in temperature introduced by varying distillation losses are greatest for the marks between 90 per cent and the dry point. The curve is ascending rapidly over this interval, and there is a relatively large variation of temperature for a small change in percentage.

The reader will observe that in practically all distillations where the loss exceeded 2 per cent the gasoline had a relatively low initial boiling point. This rule held without exception for samples showing losses in excess of 3 per cent. High distillation loss is a useful index of the percentage of casing-head gasoline in a sample, although, as has been stated before, the operations should eliminate the possibility of this having been due to improper conduct of the test.

DISCUSSION OF VARIATIONS IN VOLATILITY OF SAMPLES COLLECTED IN THE 1919 SURVEY.

SECTIONAL VARIATIONS.

The figures in Table 6, showing average distillation ranges representative of the samples collected in each State, reveal decided differences in the average volatility of gasoline marketed in different sections of the country. The products marketed in the Pacific Coast States are more volatile than those marketed in any other section of the country, with the exception of the State of South Carolina, which has a rigid legislative specification. The New England States are next as regards volatility of gasoline received, whereas the middle-western States receive motor gasoline of relatively low volatility (high average distillation temperature).

The Rocky Mountain States receive the least volatile gasoline of any section in the country. This marketing practice may perhaps be explainable on the basis of the comparatively high altitude of these States. If the samples had been distilled under the barometric conditions existing in the districts where they are marketed and used, possibly the figures might have approached more nearly those for some of the other districts that are seemingly more favored. This explanation is offered simply as a hypothesis and without evidence that the low barometric pressure that exists at higher altitudes actually facilitates the utilization of low-volatile gasoline in automobile engines.

The Atlantic seaboard States receive a general gasoline that is practically equivalent in volatility to that marketed in New England. In the Southwestern States the quality of gasoline is about the same as in the Middle West.

Figure 10, shows distillation curves representing averages of all the samples of gasoline collected in four general sections of the country, as follows: New England, Middle Western States, Rocky Mountain States, and Pacific Coast States. The reader will note that the curves practically coincide at lower temperatures but diverge at about the 20 per cent point. The maximum difference at the 90 per cent point is about 24° C.

Attention is called to the close agreement among average distillation figures for all States in each general district of the country. This is particularly noticeable for districts where the same marketing companies cover the whole district. The States of Washington and California are supplied by the same companies and receive the same grade of gasoline. The grade of gasoline sold throughout all the New England States is practically constant; the same remark holds true for the Middle-Western States with the exception of Ohio. Gasoline sold in all of the Rocky Mountain States is almost invariably of low volatility.

A few exceptions to the general rule may, however, be mentioned. West Virginia apparently receives gasoline which has a relatively

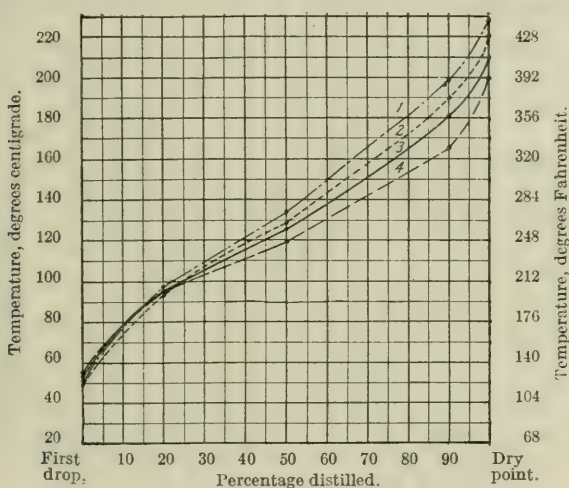


FIG. 10.—Average distillation curves of gasolines collected in four sections of the country. Curve 1, Rocky Mountain States; curve 2, Middle-Western States; curve 3, New England States; curve 4, Pacific States.

high content of casing-head gasoline, and incidentally a relatively high end point, as compared with motor fuels marketed in the adjacent States of Virginia and Pennsylvania. Gasolines sold in Montana contain higher percentages of volatile constituents than are found in samples marketed in adjoining States. Ohio receives gasoline more nearly equivalent to that marketed in New England than that marketed in Indiana. The figures representing average quality of gasoline for Wisconsin and those for Pennsylvania are somewhat abnormal, as the list of samples includes a larger proportion of so-called "high test" gasoline than is probably representative of actual marketing practice throughout the State. Hence, these two States show average volatility figures higher than would be expected from their geographic location.

VARIATIONS CHARACTERISTIC OF DIFFERENT TYPES OF BLENDED FUELS.

As has been already stated the amount of strictly "straight-run" gasoline now marketed is comparatively small. A large proportion of the gasoline sold is blended either with casing-head gasoline or cracked products, and a relatively small proportion with benzol or other coal-tar derivatives. Most of the straight-run products are marketed by the smaller companies, usually in districts adjacent to points of production. Practically all the larger companies market blended motor fuels.

CASING-HEAD BLENDS.

No clear-cut differences distinguish the various types of blended casing-head gasoline obtainable in the market, but they may be

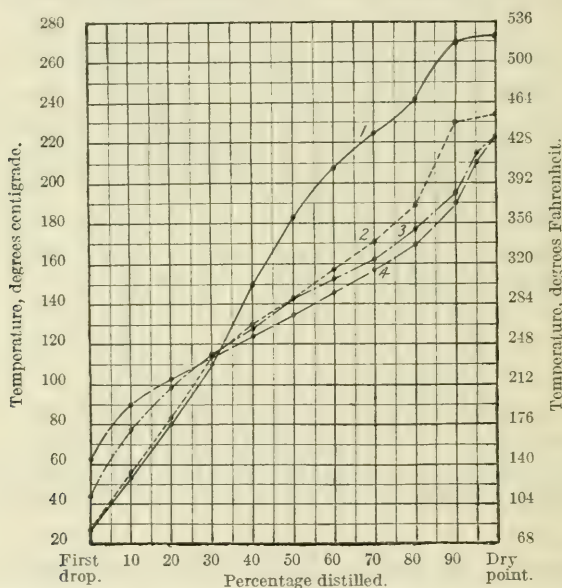


FIG. 11.—Distillation curves characteristic of different types of blended casing-head gasolines compared with a "straight" refinery gasoline. 1, Blend with kerosene; 2, blend with naphtha; 3, blend with "heavy" gasoline; 4, "straight" refinery gasoline.

divided into three general classes, according to whether the casing-head gasoline is blended with kerosene, naphtha, or a straight-run gasoline of relatively high end point. Distillation analyses of three products representative of these classes appear in Table 7; the distillation curves are shown in figure 11, in comparison with the curve for an unblended straight-run gasoline of fairly high end point. Blends of casing-head gasoline and kerosene are not marketed to any large extent and are not regarded as satisfactory fuel for present types of automobile motors. Possibly equipment might be devised which would permit their use, but products of this type do not seem to be particularly desirable as regards economy; hence little space is here given to their utilization.

TABLE 7.—Representative analyses of casing-head blends collected in the 1919 gasoline survey.

Place where sample was collected.			Gravity.		Distillation. ¹													
Sam- ple No.	Com- pany No.	City.	State.	Specific gravity.	°B.	Initial boiling point.	10 per cent mark.	20 per cent mark.	30 per cent mark.	40 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	Dry point. boiling point.	Distilla- tion loss (per cent.)
Blends of casing-head gasoline and kerosene.																		
507	157	Louisville.....	Kentucky.....	0.748	57.2	{ 81 27	{ 127 53	{ 176 80	{ 230 110	{ 304 151	{ 363 184	{ 403 206	{ 437 225	{ 468 242	{ 518 270	{ 520 271	{ 329 165	6.9
470	170	Des Moines.....	Iowa.....	.748	57.2	{ 100 38	{ 147 64	{ 192 89	{ 239 115	{ 280 138	{ 320 160	{ 356 180	{ 392 200	{ 441 227	{ 505 263	.....	.....	4.0
1067	187	Parkersburg.....	West Virginia.....	.718	65.0	{ 90 32	{ 120 49	{ 153 67	{ 192 89	{ 250 121	{ 311 155	{ 347 175	{ 392 200	{ 430 221	{ 509 265	{ 509 265	{ 300 149	7.0
Blends of casing-head gasoline with naphtha.																		
896	211	Pittsburgh.....	Pennsylvania.....	.728	62.3	{ 81 27	{ 133 56	{ 181 83	{ 235 113	{ 266 130	{ 289 143	{ 315 157	{ 340 171	{ 372 189	{ 446 230	{ 453 234	{ 282 139	7.1
819	203	Bartlesville.....	Oklahoma.....	.739	59.4	{ 102 39	{ 153 67	{ 198 92	{ 243 117	{ 273 134	{ 302 150	{ 320 160	{ 340 171	{ 365 185	{ 403 206	{ 446 230	{ 286 141	3.6
638	99	St. Louis.....	Missouri.....	.742	58.7	{ 97 36	{ 154 68	{ 194 90	{ 230 110	{ 266 130	{ 289 143	{ 316 158	{ 340 171	{ 365 185	{ 406 208	{ 453 234	{ 282 139	4.4
Blends of casing-head gasoline with "straigh" refinery gasoline.																		
531	1	Portland.....	Maine.....	.749	56.9	{ 109 43	{ 165 74	{ 194 90	{ 214 101	{ 234 112	{ 255 124	{ 279 137	{ 302 150	{ 327 164	{ 374 190	{ 410 210	{ 415 213	2.5
514	2	New Orleans.....	Louisiana.....	.747	57.4	{ 113 45	{ 163 73	{ 187 86	{ 207 97	{ 228 109	{ 243 117	{ 262 128	{ 289 143	{ 320 160	{ 363 184	{ 410 210	{ 423 217	2.8
774	3	Grand Forks.....	North Dakota.....	.760	54.2	{ 111 44	{ 171 77	{ 208 98	{ 239 115	{ 262 128	{ 289 143	{ 307 153	{ 325 163	{ 351 177	{ 383 195	{ 419 215	{ 433 223	1.8

¹ For each sample, the upper line of figures represent degrees Fahrenheit, and the lower line degrees centigrade.² Limit of the thermometer.

A more common type of blend is casing-head gasoline mixed with so-called "naphtha," the latter being a refinery product lacking the low-boiling constituents characteristic of "straight-run" gasoline and having an end point anywhere between 400 and 500° F. Casing-head blends in which the naphtha is of relatively low end point are desirable motor fuels. The blends with naphtha of high end point are probably not as satisfactory, although the bureau has not received much specific evidence indicating their disadvantage.

The most common and most desirable type of casing-head blend is that in which the natural-gas gasoline is added to straight-run gasoline of moderately high end point. Products of this type are known to be satisfactory motor fuel and there is reason to believe that they are preferable to straight-run gasolines of the same average volatility, even though the latter have lower end points. The casing-head blends contain higher proportions of volatile constituents, permit easier starting, and probably give greater flexibility in operation.

The characteristic form of curves obtained by the distillation of casing-head blends may be observed in figure 11. The general tendency is for the curve to run straight from the initial boiling point to a point above the 90 per cent mark. Straight refinery products usually show a marked change in the direction of the curve at about the 20 per cent point.

BLENDING OF CRACKED GASOLINE.

The bureau has been unable to discover any features characteristic of the volatility range of blends containing cracked gasoline.

BLENDING WITH BENZOL AND OTHER COAL-TAR DISTILLATES.

A number of samples of the 1919 survey contained enough benzol and other coal-tar distillates to permit identification by the test methods employed. Figures for such samples appear in Table 8. Other samples undoubtedly contained certain percentages of coal-tar derivatives which were, however, too small to permit reliable identification by the methods employed.

Pure benzol has a gravity of about 0.880 (29.1° B.) and a boiling point of about 80° C. (170° F.). The grade generally used for fuel purposes, however, is what is known as "90 per cent" benzol, 90 per cent of its volume distilling below 100° C. (212° F.). The additional constituent is chiefly toluol, which boils at about 110° C. (230° F.), but other hydrocarbons such as xylol may be present. The gravity of 90 per cent benzol is very little higher than that of pure benzol, being approximately 30° B.

The presence of benzol or other coal-tar hydrocarbons is usually easy to detect by the characteristic odor or by the gravity of the mixture. Besides, the distillation range of such mixtures has certain characteristics because there are usually present unusual proportions of one or two individual components that have constant boiling points and therefore tend to produce flattening of the distillation curve.

The samples represented in Table 8 contained varying proportions of benzol, ranging in order from sample 407, a commercial grade of benzol to sample 550, which was gasoline blended with less than 20

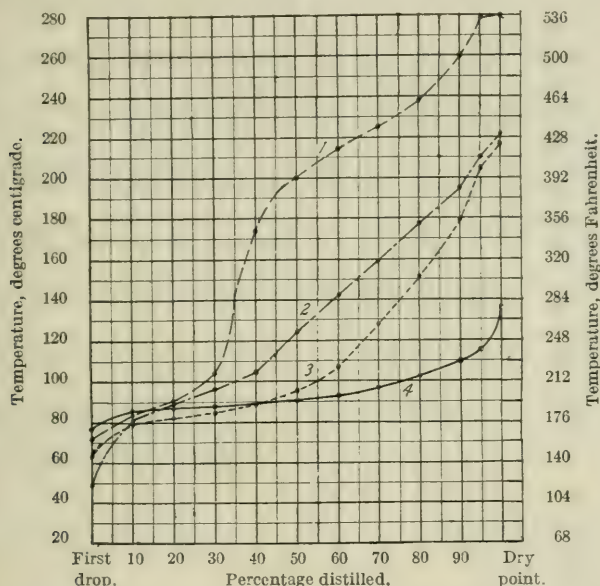


FIGURE 12.—Distillation curves of typical benzol blends. Curve 1, sample 766, gravity 39.6° B.; curve 2, sample 783, gravity 49° B.; curve 3, sample 732, gravity 44.3° B.; curve 4, sample 407, gravity 30.6° B.

per cent of benzol. Most of the samples given in this table have relatively low gravities, the average being lower than 50° B., although their average boiling points correspond to those of "high test" gasolines. Distillation curves for typical blends are presented in figure 12. The curves show characteristic breaks which evidently occur immediately after the benzol contained in the sample has been distilled off. The break is particularly noticeable in the curve representing sample 766, which was a mixture of approximately 70 per cent kerosene and 30 per cent benzol.

TABLE 8.—Results of analyses of benzol blends collected in the 1919 gasoline survey.

Place collected.			Gravity.		Distillation. ¹												Average boiling point.
Sample No.	Com-pany No.	City.	State.	Specific gravity.	°B.	Initial.	10 per cent mark.	20 per cent mark.	30 per cent mark.	40 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.		Dry point.
270	249	Montgomery.....	Alabama.....	0.781	49.3	{ 154 68 85	185 199	212 100	230 110	253 123	277 136	297 117	325 163	358 181	392 200	414 212	264 129
405	131	Chicago.....	Illinois.....	.821	49.5	{ 158 70 83	176 181	185 85	189 87	196 91	208 98	234 111	260 114	290 182	309 209	446 230	239 115
407	208	do.....	do.....	.872	30.6	{ 169 76 86	187 189	190 88	192 89	196 91	199 93	207 97	216 102	230 110	239 115	277 136	205 96
409	217	do.....	do.....	.860	32.8	{ 167 75 82	180 181	183 84	187 86	190 88	198 92	208 103	217 105	246 116	268 208	446 230	243 117
445	141	Indianapolis.....	Indiana.....	.792	46.8	{ 140 63 83	181 189	198 87	207 92	217 103	235 113	262 128	306 132	349 176	388 198	417 214	246 119
447	141	do.....	do.....	.796	45.9	{ 154 68 82	180 189	196 87	208 91	217 95	232 111	261 129	318 159	363 181	399 204	426 219	250 121
516	252	Baltimore.....	Maryland.....	.816	41.6	{ 112 61 65	119 153	154 67	156 68	160 71	178 81	232 111	347 175	419 215	487 253	507 264	233 115
549	154	Boston.....	Massachusetts.....	.773	51.1	{ 154 68 84	183 194	203 90	216 95	232 102	244 111	277 136	302 150	334 168	374 190	399 204	248 120
550	154	do.....	do.....	.766	52.8	{ 151 66 85	185 198	208 92	223 98	239 106	248 115	271 133	306 152	342 172	374 190	401 205	252 122
581	141	Grand Rapids.....	Michigan.....	.799	45.2	{ 165 74 84	183 190	194 88	201 90	214 94	232 111	263 145	335 163	369 187	406 208	441 227	255 124
688	251	Newark.....	New Jersey.....	.852	31.3	{ 169 76 85	189 189	192 87	196 89	201 91	207 97	214 101	226 108	248 130	320 160	338 181	217 103
710	144	Buffalo.....	New York.....	.805	43.9	{ 153 67 82	180 187	190 86	201 88	212 94	230 110	262 128	304 151	349 176	385 211	412 244	244 118
711	144	do.....	do.....	.806	43.7	{ 158 70 84	183 190	198 88	205 92	219 104	237 114	270 132	306 152	347 175	385 213	415 248	248 120

712	144	do.....	.806	43.7	{	160	180	194	203	210	226	248	271	302	345	381	410	250
		do.....			{	71	82	90	95	99	108	120	133	150	174	194	210	121
719	231	do.....	.770	51.8	{	113	180	198	219	248	282	307	327	349	392	428	458	277
		do.....			{	45	82	92	104	120	139	153	164	176	200	220	236	136
732	182	Rochester.....	.803	44.3	{	145	174	180	185	192	203	225	261	306	354	401	421	241
		do.....			{	63	79	82	85	89	95	107	127	152	179	205	216	116
733	182	do.....	.803	44.3	{	133	178	183	187	194	203	221	250	304	352	403	430	241
		do.....			{	67	81	84	86	90	95	105	121	151	178	206	221	116
735	212	do.....	.845	35.7	{	172	185	190	194	199	207	217	234	253	291	333	383	230
		do.....			{	78	85	88	90	93	97	103	112	123	144	167	195	110
736	212	do.....	.845	35.7	{	172	187	190	194	199	207	217	234	255	289	331	383	230
		do.....			{	78	86	88	90	93	97	103	112	124	143	166	195	110
746	253	Syracuse.....	.805	43.9	{	167	178	187	192	199	210	230	266	306	349	385	415	246
		do.....			{	75	81	86	89	93	99	110	130	152	176	195	213	119
766	173	Fargo.....	.827	39.3	{	162	181	194	219	247	292	327	377	462	500	536	576	351
		North Dakota.....			{	72	83	90	104	115	123	145	160	178	200	280	280	177
782	106	Cleveland.....	.782	49.0	{	145	183	192	203	221	233	293	320	332	390	419	430	273
		do.....			{	63	84	89	95	105	123	145	160	178	199	215	221	134
783	106	do.....	.782	49.0	{	120	178	192	205	221	237	289	318	351	381	410	432	268
		do.....			{	49	81	89	96	105	125	143	159	177	195	210	222	131
784	29	do.....	.789	47.4	{	163	187	198	210	228	253	286	316	345	383	417	441	273
		do.....			{	73	86	92	99	109	123	141	158	174	195	214	227	134
786	141	do.....	.768	55.3	{	158	201	216	230	244	264	284	307	327	356	385	415	273
		do.....			{	70	94	102	110	118	129	140	153	164	180	196	213	134
809	147	Toledo.....	.798	45.4	{	122	172	185	194	205	221	241	277	309	352	396	417	244
		do.....			{	50	78	85	90	96	105	116	136	154	178	202	214	118
806	141	Harrisburg.....	.791	47.0	{	156	185	194	207	226	268	307	333	358	390	426	448	279
		Pennsylvania.....			{	69	85	90	97	108	131	153	167	181	199	219	231	137
889	251	Pittsburgh.....	.831	38.5	{	144	180	189	196	203	216	239	275	342	414	450	471	261
		do.....			{	62	82	87	91	95	102	115	135	172	212	232	244	127

¹ Upper line of figures, for each sample, shows Fahrenheit degrees, and the lower line, centigrade degrees.

Among the samples represented in Table 8 two others deserve special mention; their distillation curves are presented in figure 13. Sample 688 represented a commercial product, the gravity of which indicates that it consists almost entirely of coal-tar distillates, principally benzol and toluol. Sample 546 represented a product which has not been completely determined, but which is known to contain alcohol as well as benzol. Both of these products are at present being marketed in a commercial way.

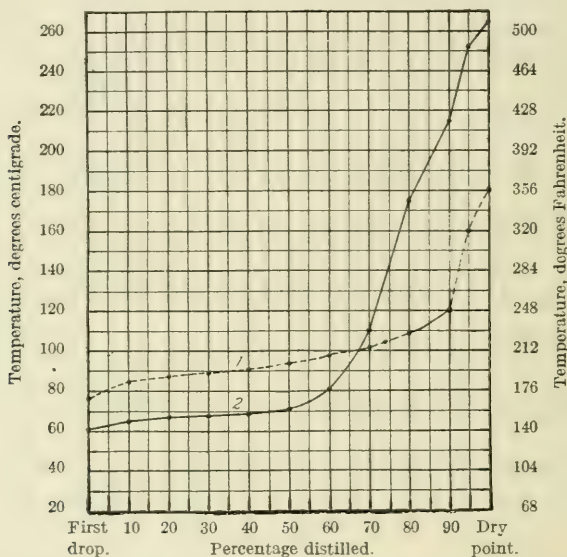


FIGURE 13.—Distillation curves of two gasoline substitutes now on the market. Curve 1, (sample 688) a blend containing benzol, toluol, and petroleum naphtha; curve 2, (sample 546) a blend containing alcohol, benzol, and kerosene.

VOLATILITY OF PETROLEUM PRODUCTS HEAVIER THAN GASOLINE BUT SOMETIMES USED AS MOTOR FUEL.

In addition to the petroleum products marketed as gasoline others of different properties are employed to a certain extent as motor fuel. The two principal classes of such products are kerosene and naphthas, the latter including the type of product sold on the Western Coast as engine distillate. Distillation curves for a sample of kerosene, a sample of naphtha produced from Pennsylvania crude oil, and one of California engine distillate appear in figure 14. These curves show very clearly the characteristic properties of fuels of this type. The general range of boiling points of the two naphthas is slightly higher than that of average grades of gasoline but is of the same general order. There is, however, a marked deficiency of constituents of low-boiling point. Kerosene is a product entirely distinct from gasoline or naphtha, having a high range of boiling points which overlaps the gasoline and naphtha range only to a limited degree.

There is a more or less general impression that retail stations adulterate gasoline with kerosene before selling it to the consumer. The distillation tests of samples collected in the 1919 survey show conclusively that this impression is false. Samples were obtained from every type of retail station from a grocery store to an elaborate filling station, and in only a negligible number was there any evidence that kerosene had been mixed with the gasoline. Most of the samples that contained kerosene were blends with casing-head gasoline, not ordinary gasoline. Blends of casing-head gasoline and kerosene are not regarded as highly desirable motor fuel, but they are not prepared with any intention of defrauding the consumer.

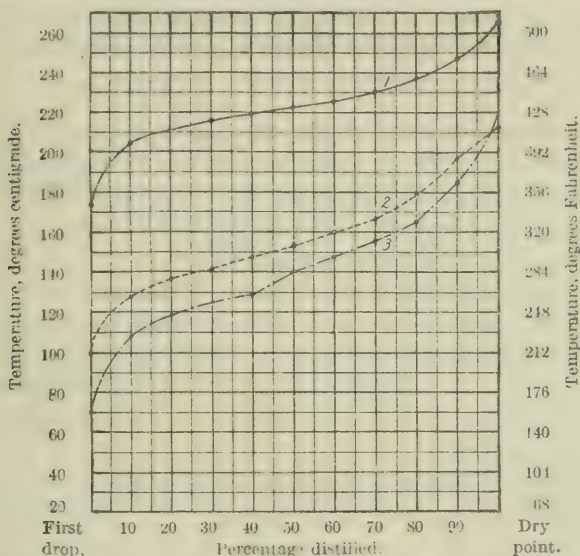


FIGURE 14.—Distillation curves of three petroleum products other than gasoline, which are sometimes marketed as motor fuel: 1, Kerosene from Pennsylvania crude oil; 2, engine distillate from California crude oil; 3, naphtha from Pennsylvania crude oil.

In order to support the conclusion that kerosene was not present in the samples collected, the bureau made some tests of the distillation range of mixtures prepared in its own laboratory. To a sample of motor gasoline having a 90 per cent point of 180°C . (356°F .) and a dry point of 217°C . (423°F .) was added 10 per cent of ordinary kerosene. The 90 per cent point was increased to 201°C . (394°F .) and the dry point to 252°C . (486°F .). The addition of larger percentages of kerosene raised the dry point of the mixture to the figure obtained on distillation of the kerosene, which was 275°C . (527°F .).

The chief use of kerosene as motor fuel is for types of engines running at practically constant speed and relatively high load. Farm tractors are at present a prominent example. Kerosene is not regarded as satisfactory fuel in ordinary types of internal combustion

engines when flexibility of operation and ready starting are desired. Certain devices have been developed that are claimed to permit ordinary engines to utilize kerosene, but these have not as yet come into general use.

The products classed as naphthas and including so-called engine distillates, are used more or less extensively as fuel for motor trucks and other mobile equipment where only moderate flexibility is needed. Naphthas and engine distillates are claimed to be notably superior to kerosene because of causing less carbonization in engine cylinders. They permit easier starting and more flexibility, although they are distinctly inferior to gasoline in these particulars.

DISCUSSION OF RESULTS OF 1919 SURVEY AS TO VARIATIONS IN REFINING AND MARKETING PRACTICES.

CLASSIFICATION OF TYPES OF COMPANIES.

In Table 9 results of tests of the 1919 survey are arranged to show features characteristic of the refining practice of various companies. The company numbers are the same as those appearing in Table 16. The companies are divided into three general classes: Large refiners and marketers, small refiners, and jobbers.

Under the heading "large refiners and marketers" are grouped 23 companies that manufacture and market more than 75 per cent of the gasoline produced in the country. Two companies included in this list do not operate refineries and are strictly marketing companies. All the others operate large refineries and manufacture gasoline as well as market it.

The class of small refiners includes, in addition to companies that do a small business, several that manufacture considerable quantities of gasoline, but do not sell directly to the retail trade. Companies of this type turn their products over either to the large marketing concerns or to jobbers, with the result that their gasoline is not sold under the name of the manufacturing or refining company. Companies of this type are relatively few, as most of the large refiners market their own products, generally under trade names.

The list of small refiners probably is not complete; there are so many that it would be difficult to get samples from all. The writers believe, however, that the companies omitted do not manufacture as much as 5 per cent of the total gasoline produced in the country.

In the class of jobbers are included companies that purchase gasoline from refiners and sell to retail stations; some of them operate retail stations under their own names. A few of these companies have casing-head gasoline plants; a large number have blending stations where casing-head gasoline is mixed with "heavy" gasoline or naphtha, but none of them are known to operate refineries. Products sold by these jobbing companies include gasolines made by practically every refinery in the country, some of the samples col-

lected representing mixtures of products from two or more refineries. Of course, gasoline marketed under the name of a refining company is not necessarily produced by that company, because frequently refineries having a large marketing business purchase gasoline from other companies that may have more producing capacity than marketing facilities. However, the discrepancies introduced in this way are not believed sufficient to invalidate the information regarding the refining practice of each company.

Whenever possible, samples are listed under the name of the refining company rather than that of the marketing company. In many instances the information obtained at the time of collecting the sample did not show which refinery it came from, and such samples are listed under the name of the jobbing or marketing companies.

COLOR CHARACTERISTIC OF PRODUCTS OF THE DIFFERENT COMPANIES.

Comparatively few of the samples examined were reported as water white, but most of them were only slightly yellow in color. The tests for color were only roughly quantitative, and no particular emphasis has been laid on this property, particularly as numerous discrepancies have undoubtedly been introduced by contamination of samples between the refinery and the point where they are served to the consumer. For the present series of samples nothing need be noted, except that companies 7 and 9 had a higher percentage of samples reported as water white than any of the other companies.

ODOR CHARACTERISTIC OF PRODUCTS OF DIFFERENT COMPANIES.

Odor is a property that had not been considered as indicative of the quality of gasoline, except in a few instances when the odor was exceptionally bad. Its principal use is as a means of distinguishing the method of manufacture of gasoline and, for some gasoline, the type of crude from which it is obtained. Gasoline containing cracked products usually has a characteristic odor. The same remark is true for blended casing-head gasoline, particularly when the casing-head constituents contain high proportions of sulphur compounds, and for gasoline made from California crude. Usually gasoline made from crude oil of high sulphur content can be distinguished by its odor.

The number of samples having a sweet, pleasant odor was comparatively small, this property being limited to the few "high-test," straight-run products on the list. Samples in which the odor was reported as "very bad" usually contained highly cracked constituents or sulphur compounds. In the majority of samples the odor was reported as either "poor" or "fair," which indicates that although not sweet it was not particularly objectionable. However, the personal equation plays an important part in this test, and sample reported as of "poor" odor by one person might be reported as "fair" by another.

TABLE 9.—Data showing averages of analytical figures for the series of samples collected from different companies, in the 1919 gasoline survey.

LARGE REFINERS AND MARKETERS.

Company, etc.	Acidity (percentage of samples passing each requirement).			Doctor test (percentage of samples passing test).	Unsaturation (average percentage).	Corrosion and gumming test.		Average distillations.				
	Methyl orange.	Litmus.	Phenolphthalein.			Average weight of residue (grams).	Percentage of samples having residues below 0.030 gram.	Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.
1.....	98	100	97	97	3.2	0.046	69 {	120 49	205 96	262 128	361 183	417 214
2.....	89	98	82	67	3.0	.042	67 {	117 47	189 87	246 119	360 182	421 216
3.....	75	92	84	87	8.4	.030	65 {	108 42	198 92	286 141	408 208	446 230
4.....	76	97	84	68	2.4	.022	84 {	129 54	240 110	266 136	369 187	428 220
5.....	90	97	87	42	5.7	.028	77 {	133 56	214 101	264 129	354 203	412 211
6.....	65	73	73	12	3.1	.050	23 {	122 50	205 96	270 132	397 203	459 237
7.....	96	100	88	68	4.1	.054	52 {	124 51	203 95	259 126	367 186	426 219
8.....	85	90	80	65	3.8	.032	70 {	138 59	210 99	259 126	349 176	412 211
9.....	63	90	63	89	1.8	.022	89 {	138 59	208 98	259 126	363 184	428 220
10.....	89	100	72	76	5.7	.057	50 {	122 50	205 96	273 134	394 201	446 230
11.....	71	91	65	53	3.0	.113	65 {	135 57	208 98	257 125	363 184	428 220

12.	100	94	100	70	5.8	.023	{	127	217	273	309	425	335
							{	53	103	134	187	219	127
13.	100	100	88	100	1.3	.030	{	131	203	243	318	376	246
							{	55	95	117	159	191	119
14.	87	100	60	67	2.4	.025	{	118	192	257	338	388	246
							{	48	89	114	170	198	119
15.	67	100	67	80	3.7	.035	{	115	205	277	378	421	275
							{	46	96	136	193	216	135
16.	91	91	82	100	1.5	.026	{	125	219	282	331	394	296
							{	57	104	128	166	201	130
17.	83	100	92	58	6.3	.020	{	127	217	277	378	428	280
							{	53	103	136	192	226	138
18.	80	100	90	20	4.0	.056	{	126	201	259	300	424	284
							{	52	94	126	182	218	128
19.	100	100	88	75	1.3	.018	{	140	214	252	325	405	261
							{	60	101	122	163	207	127
20.	100	71	100	71	3.3	.009	{	142	212	255	342	403	262
							{	51	100	124	172	206	128
21.	72	72	100	100	6.3	.027	{	122	212	268	356	405	266
							{	50	100	131	180	207	130
22.	80	40	100	60	8.4	.015	{	104	207	268	369	423	268
							{	40	97	131	187	217	131
23.	50	50	100	50	6.8	.040	{	99	192	293	417	442	296
							{	37	89	145	214	228	141
Average for the 23 companies.							{	124	205	262	367	423	268
							{	51	96	128	186	217	131

SMALL REFINERS.

Average of 118 samples from 58 companies.	81	93	73	82	2.6	0.032	{	131	201	252	354	414	262
							{	55	94	122	179	212	128

JOBBER8.

Average of 226 samples from 127 companies.	76	81	78	65	3.2	0.069	{	124	201	250	367	424	264
							{	51	94	126	186	218	129

Products made by several of the small refiners are all reported as of "good" odor. These gasolines were for the most part straight-run products, some of them of relatively high volatility. For the different larger companies there appears to be no decided variation among the percentages of samples reported under the several descriptive heads of "good," "fair," "poor," and "bad" odor, with the exception of companies marketing cracked products. These companies are characterized by an unusually high percentage of samples of which the odor is reported as "poor" or "bad." Very few samples of the entire list had odors which would render them objectionable in use.

ACIDITY CHARACTERISTIC OF PRODUCTS OF DIFFERENT COMPANIES.

As has been stated on page 40, three methods were used for testing the acidity of the samples. After the distillation was completed the residue remaining in the flask was shaken with distilled water and this water extract divided into three portions. The first portion was tested for acidity by using methyl orange as an indicator; the second portion was tested with litmus paper, and the third portion was tested by adding phenolphthalein solution necessary to give a pink color. A study of the results of these tests shows that there is no fixed relation between the three methods—for instance, samples giving an acid reaction with methyl orange indicator were found neutral according to the other indicators, and vice versa. In most tests, however, samples requiring several drops of alkali solution for neutralization in the phenolphthalein test were acid to both methyl orange and litmus. In general, the phenolphthalein test appeared to be the most delicate, the methyl orange next, and the litmus test very unsatisfactory.

The phenolphthalein test detects minute quantities of acid and is so sensitive that if gasoline were required to be strictly neutral to this indicator more than 50 per cent of the samples analyzed would fail to pass the test. Absolute neutrality is indicated by development of a pink color on addition of one drop of N 100 alkali solution. The phenolphthalein test should, therefore, be made slightly more lenient and samples permitted to pass when pink color was developed on the addition of two drops of N 100 sodium hydroxide solution. The number of samples that passed on the basis of addition of two drops of alkali solution was practically the same as the number passing the methyl orange test.

The latter test proved the most satisfactory of the three and is preferred. The litmus test was so indefinite that in the majority of determinations the observers were not certain of their results and reported them as positive-or-negative ($\pm$). Possibly this test could

be improved either by using the litmus solution or by specifying some particular grade of sensitive litmus paper. This is, however, not recommended in view of the availability of the satisfactory methyl orange test.

The acidity tests indicate presence of either free acid or combined acid in the gasoline samples; the combined acid, if present, being freed in the course of distillation. The presence of free acid would be indicative of careless refining and could be detected by shaking the original gasoline sample with water rather than by extracting the residue in the distillation flask. The bureau has never detected the presence of free acid in samples, although possibly it may have been present in some. By making the test upon the distillation residue the presence of combined acid as well as free acid may be detected, which is desirable in view of the fact that conditions in an internal-combustion engine would favor the liberation of so-called combined acid.

The percentages of samples from various companies that passed each of the three acidity tests are shown in Table 9 (p. 72). The reader will observe that with the exception of companies 6, 9, 11, and 15 there is practically no characteristic variation. In this connection attention is called to the fact that the percentage of samples passing acidity tests varied considerably in various States. For some States 100 per cent of the samples passed these tests, whereas for others, such as Arkansas, Indiana, Kansas, and Michigan, the percentage was relatively low. No satisfactory explanation as to the causes of this variation was found.

The results of the acidity tests do not parallel results of other tests designed to indicate care in refining, such as the "doctor" test or the corrosion or gumming test. Some companies market products which are indicated as inferior by other tests as well as that for acidity, but the relation holds only for a limited number of the products examined.

"DOCTOR" TESTS CHARACTERISTIC OF PRODUCTS OF DIFFERENT COMPANIES.

The percentage of samples from different companies that passed the "doctor" test is shown in column 4, Table 9. The products of the various companies show marked differences in this particular. For instance, only 12 per cent of the samples refined by company 6 passed the test, whereas all samples produced by companies 13, 16, and 21 were passed. Percentages for other companies ranged from 20 to 97 per cent and were in most instances above 60 per cent. There was no definite relation between the number of samples passing the "doctor" test and those passing the various other tests. For instance, of the samples collected in Arkansas 100 per cent passed

the "doctor" test, but only 8 per cent passed the methyl orange test for acidity.

The number of samples passing the "doctor" test varies as widely for different parts of the country as it does for different marketing companies. All the samples from Arizona, Arkansas, Mississippi, New Mexico, South Carolina, and Vermont were passed; the percentages passing in some of the other States were as follows: New Jersey, 30 per cent; Utah, 37 per cent; South Dakota, 39 per cent; and North Dakota, 42 per cent. As regards general sections of the country, practically all gasoline sold on the Pacific coast passed the test, whereas in the Middle West and Rocky Mountain sections the number passing the test is relatively lower.

The value of the "doctor" test in indicating the utility of gasoline in actual service is questionable. Refiners employ this test to ascertain whether their products are likely to decompose in handling and storage, with the development of yellow color and disagreeable odor. It has not been conclusively demonstrated, however, that this decomposition actually impairs the serviceability of the gasoline.

UNSATURATION CHARACTERISTIC OF PRODUCTS OF THE DIFFERENT REFINING COMPANIES.

Column 6 of Table 9 shows the average percentage of unsaturation of products marketed by the different companies. Percentage of unsaturation is an index of the proportion of cracked constituents contained in the gasoline and is not regarded as an index of actual quality. "Straight-run" gasoline and blends of casing-head gasoline with straight-run gasoline or naphtha usually contain not more than 1 or 2 per cent of material soluble in sulphuric acid, although a few products contain as high as 4 per cent. Unblended cracked gasoline usually contains between 20 and 30 per cent of material soluble in sulphuric acid, and rarely as much as 40 per cent. Among the samples of the present survey, only one was an unblended cracked gasoline, this sample (No. 877) being 22 per cent unsaturated. A considerable number of samples had unsaturation figures of 10 to 12 per cent, which indicated that they contained 40 to 50 per cent of gasoline made by cracking processes.

Practically all of the companies whose products are characterized by a high unsaturation figure operate cracking processes or purchase from companies operating such processes. Samples from companies that manufacture and sell straight-run products have low average figures for unsaturation, usually below 3 per cent. Average unsaturation figures for some of the companies are higher than might be expected from general information regarding their use of cracking processes, but this is generally due to their purchasing gasoline from other companies that do operate cracking processes.

The figures on unsaturation percentages are of interest chiefly in showing the importance of cracking as a source of motor fuel. Cracked gasoline is not regarded by the bureau as inferior to other types, particularly when blended according to the usual practice. Cracked gasolines may possibly be inferior to the more highly saturated types as regards certain characteristics of behavior in engines, but the differences are relatively slight, and in any event are likely to be compensated by certain advantages that have been observed in the course of engine tests made by the bureau, the results of which are to be published at some future date.

CORROSION AND GUM-FORMATION CHARACTERISTIC OF PRODUCTS OF THE DIFFERENT COMPANIES.

The so-called copper-dish test for corrosion and gum formation was devised for testing gasoline used in airplanes, and has not been found satisfactory by the bureau as a test for the ordinary grades of gasoline. Observations recording corrosion indicate roughly the proportion of sulphur or sulphur compounds present in the gasoline, but the quantity of gum is dependent as much upon details of the test as upon the chemical composition of the gasoline. (Some recent experiments of the bureau have indicated that the quantity of gum formed may perhaps be increased a hundred-fold by lengthening the period of evaporation.) Results of the copper-dish test are recorded in this bulletin simply to show the magnitude of variation and not because the test is regarded as desirable for the study of the properties of gasoline. Tests were made because some doubt existed regarding this possibility before the series of experiments was performed.

A relatively small number of the samples tested showed neither gum nor corrosion, the copper dish being as bright at the end of the test as at the beginning. For another small number of samples the dish became iridescent, but did not show sufficient residue to be detected by the ordinary analytical balance. The majority of the samples, however, gave a decided test for corrosion and a deposit of gum that could be weighed. In some the deposit was a gray or black coating which was identified as a copper salt, undoubtedly copper sulphide formed by action of sulphur, either free or combined, contained in the gasoline. Some of these sulphide deposits were flaky and peeled off after the dish had stood for some time. Others adhered firmly to the surface of the copper and could be removed only by use of abrasives. In a few instances there was, in addition to the metallic deposit, gum or varnishlike material.

The gums formed varied in different samples from transparent varnishlike materials to dark-colored pitches. All of these gums became hard on standing and some of them were decidedly brittle.

They were relatively soluble in alcohol or benzol and practically insoluble in gasoline. Oxidation was believed to play a considerable part in their formation, and this fact has been confirmed by some recent experiments, results of which are not yet ready for publication.

Some of the samples showed oily residues in the dish after heating for several hours. These oils seemed for the most part to be heavy fractions contained in the gasoline, but occasionally were similar to lubricating oils. The presence of such heavy oils was no doubt due in many cases to contamination of the sample with lubricating oil at the time it was collected, as the funnels used in filling sample cans were frequently the ones used in filling stations for lubricating oil and may not always have been thoroughly washed.

The weights of residues in the copper dishes varied from a few milligrams to more than three grams, the latter extreme being an oily residue which could not be evaporated on the steam bath. Practically all of the slight deposits weighed less than 50 mg. and those above 100 mg. were practically always of an oily nature.

On evaporating samples containing high percentages of casing-head gasoline the dish usually showed bad corrosion, undoubtedly due to the presence of sulphides in the casing-head gasoline. Gasoline containing cracked constituents almost invariably gave a deposit of gum, the quantity of which, however, bore no relation to the percentage of unsaturation. Some samples which were free from cracked products gave gummy deposits, wherefore it appears that gum formation is neither a qualitative nor quantitative indication of the presence of unsaturated hydrocarbons. The copper-dish test also failed to show any relation with other tests such as the "doctor" test; as a matter of fact some of the samples showing up worst as regards corrosion were "sweet" to the "doctor" test. This probably was due to the fact that in an effort to refine gasoline so that it would pass the "doctor" test without question an excess of sulphur was dissolved in it.

The results of the corrosion and gumming tests as applied to products marketed by different companies appear in columns 7 and 8 of Table 9.

Column 7 gives the average weight of residue of the products marketed by each company. Company 20 has the lowest average, 9 mg., and company 11 is highest, with a weight of 113 mg. However, this method of showing results is not satisfactory, as the average may oftentimes be substantially raised by including in a company's list one or two samples having an abnormally high residue, generally of an oily nature. For instance, company 11 had a single sample with a residue of 1.520 grams; the average given for this company, as stated above, was 113 mg., but by excluding this single sample the figure is reduced to 26 mg.

A more satisfactory scheme of grading samples with regard to gum formation is that on which are based the figures tabulated in column 8 of Table 9. This column gives the percentages of samples marketed by each company having a residue less than 30 mg. the latter figure being chosen not as a suggested specification limit but because it appeared to be a sort of dividing line between high and low weights of residue. According to this scheme of classification companies 20 and 22 have 100 per cent of samples meeting the requirements, whereas companies 23, 6, 10, and 7 have respectively 0, 23, 50, and 52 per cent of samples that showed residues less than 30 mg. The differences shown by the gumming and corrosion tests are less marked for the various States than for the various refining companies. The States of New Mexico, South Dakota, Ohio, and South Carolina are characterized by high percentages of samples with residues below the limit of 30 mg.; Minnesota, West Virginia, and North Carolina are at the other extreme, with less than 35 per cent passing that requirement.

GRAVITY CHARACTERISTIC OF PRODUCTS OF DIFFERENT COMPANIES.

Gravity measurements fail to show anything characteristic of the products of different companies except as regards the source of their crude petroleum, this information being discussed in connection with the volatility figures.

VOLATILITY CHARACTERISTIC OF PRODUCTS OF DIFFERENT COMPANIES.

Table 16 (pp. 190 to 243), showing the analytical results grouped under company headings, does not include full sets of figures for distillation range. The temperatures for the initial boiling point 20 per cent mark, 50 per cent mark, 90 per cent mark, and dry point are considered sufficient for present purposes of discussion. If figures for the full distillation curves are required they can be found in Table 15 (pp. 114 to 189) under sample and company numbers corresponding to those of Table 16.

The distillation tests indicate that in general the various companies market gasoline of the same volatility range regardless of the section of the country that is supplied. It has already been shown (see fig. 10, p. 61) that the different sections of the country have characteristic differences in the average volatility of gasoline received. In spite of this it will be observed that companies marketing in different sections, generally, though not invariably, maintain a uniform grade of volatility. For instance, gasolines marketed in the Middle West are less volatile than those marketed in New England, but certain companies supplying both sections of the country sell the

same grade of gasoline in each, and as a result market in the Middle West gasoline that is more volatile than that of their competitors. This relation does not hold invariably, as in some sections of the country certain refiners market a grade similar to that supplied by their competitors rather than the grade marketed by themselves in other districts.

Table 9 (p. 72) shows figures representing the average of the distillation results of samples for each of 23 large refining and marketing companies, 58 small refineries, and 127 jobbers. The differences in the average distillation figures characteristic of the individual companies are as great as those characteristic of various sections of the country. Companies 13, 14, 16, and 19 market products that are of

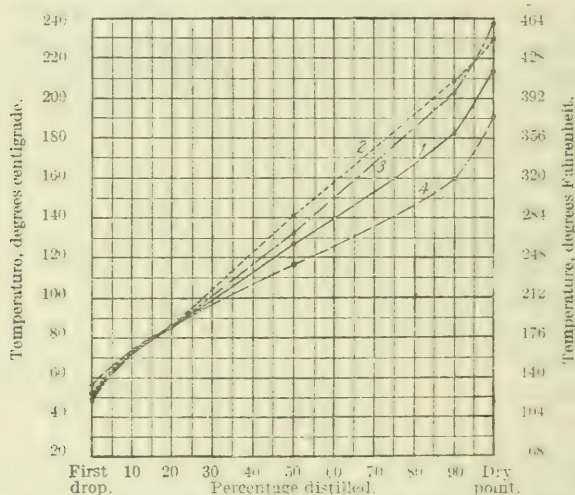


FIGURE 15.—Average distillation curves of samples from four large refinery companies. 1, company 1; 2, company 3; 3, company 6; 4, company 13.

relatively high volatility, whereas companies 3, 6, 10, and 23 market products that are relatively low. Some of the small refiners and jobbers market products that are less volatile than those sold by any of the large companies. In general, however, jobbers' samples show the same tendency in volatility as the products of the large refiners. The small refiners, as a rule, manufacture gasoline of relatively high volatility.

It may also be observed that the differences characteristic of various companies are more largely in the high-boiling fractions than in the low-boiling. Figure 15 shows the average distillation curves represented by samples from four companies. The curves practically coincide from the initial boiling point to the 20 per cent mark, but above this point begin to diverge, the maximum difference at 90 per cent being 50° C. (90° F.).

GRADE OF GASOLINE MARKETING IN 1919 AS COMPARED WITH REQUIREMENTS OF OCTOBER, 1918, SPECIFICATION.

In order to ascertain the desirability of modifications in the Government gasoline specification of October, 1918, results of the 1919 survey were arranged and studied to show how nearly present marketing practice conforms with the Government requirements. A report on this study was submitted by the Bureau of Mines to the Committee on Standardization of Petroleum Specifications. Such parts of this report as are of interest are included in the present bulletin.

PROPORTION OF SAMPLES MEETING THE SPECIFICATION.

The distillation figures for each sample were compared with those of the specification to ascertain what percentage would pass each of the individual requirements. Inasmuch as some samples satisfy requirements at one point but fail to pass at others, the number passing all requirements was less than that satisfying the most rigid limit. Results of this study of figures are shown in the following tabulation.

Percentages of samples passing the distillation specifications.

Specification mark.	First drop.	20 per cent.	45 per cent.	90 per cent.	Dry point.
Maximum distillation temperature required..... $\left\{ \begin{array}{l} ^\circ\text{C.} \\ ^\circ\text{F.} \end{array} \right.$	60	105	135	180	224
Percentage of samples satisfying requirement.....	140	221	275	356	428
	81.7	89.0	89.7	37.2	50.1
Percentage of samples satisfying all requirements.....	26.9				

From this table the 90 per cent limit was obviously the most rigid and the 20 per cent and 45 per cent marks were least stringent. However, the specification evidently does not conform to marketing practice for the spring of 1919, and organizations buying gasoline on the October, 1918, specification would be likely to encounter more or less difficulty in obtaining supplies in the open market. This difficulty would be relatively great in some sections and relatively slight in others. Practically all gasoline sold on the Pacific coast could pass the specification at all points, as would a fairly high proportion of the motor fuel sold in New England and along the Atlantic seaboard. On the other hand, practically none of the gasoline sold in the Middle West and in the Rocky Mountain States would meet the requirements.

Of the various companies some had a high percentage of samples satisfying Government specifications, others a low percentage. The

high figure was 81.74 per cent of samples passing the requirements, and the low figures, 2 per cent and 12 per cent. The proportion of samples satisfying the requirements which were obtained from each of the three groups of companies—large refiners, small refiners, and jobbers—showed no characteristic difference, the percentages being, respectively, 31, 27, and 23. However, there were characteristic differences in the points at which samples obtained from different types of companies failed to meet requirements. For instance, a relatively high percentage of the samples produced by small refiners failed to satisfy the initial boiling point limit. This is obviously due to the fact that casing-head gasoline is used to a lesser degree by small refiners than by the larger ones.

PROBABLE EFFECT ON MOTOR-FUEL PRODUCTION IF THE SPECIFICATION HAD BEEN UNIVERSALLY ADOPTED.

The October, 1918, specification was drafted for use for Government purchases of gasoline, but the consumers in general tended to regard it as a desirable standard of quality. Therefore an effort was made to ascertain the probable effect on the country's total production which might result if this specification were to be universally enforced. Study of distillation figures and of the statistical evidence at hand indicate that universal enforcement would result in a decreased production equivalent to about 5 per cent of the motor fuel refined in the calendar year 1918 (approximately 4,000,000 barrels).

TENTATIVE RECOMMENDATIONS OF THE BUREAU OF MINES REGARDING REVISION OF THE SPECIFICATION.

In view of the possible decrease in production just discussed and the difficulty incident to obtaining in the general market gasoline that satisfied the requirements, the bureau recommended a revised specification. (The scheme of adopting two specifications for slightly different grades of gasoline was considered as undesirable.) The bureau's recommendation was that changes be made for the 90 per cent points and dry points, the former to be raised 10° C. (18° F.), the latter 5° C. (9° F.). Instead of using a 45 per cent mark, a 50 per cent mark was recommended, this, however, being equivalent to the 45 per cent mark in the old specification. (The average difference between the 45 per cent and 50 per cent marks for all the samples examined was approximately 5° C. or 9° F.; therefore in the new specifications a 50 per cent mark of 140° C., or 284° F., was substituted in place of a 45 per cent mark of 135° C., or 275° F.)

The distillation requirements of the revised specification, hereafter referred to as the October, 1919, Government specification, are as follows:

Distillation requirements of October, 1919, specification.

Initial boiling point not above.....	60° C. (140° F.)
20 per cent mark not above.....	105° C. (221° F.)
50 per cent mark not above.....	140° C. (284° F.)
90 per cent mark not above.....	190° C. (374° F.)
Dry point not above.....	225° C. (437° F.)

A study of the distillation analyses of the various samples of the 1919 survey showed that about 46 per cent would satisfy this specification, as against only about 27 per cent satisfying the October, 1918, specification. As regards effect on production, however, it has been estimated that its universal adoption should result in an actual increase of approximately 1 per cent of the nation's supply, for although there would be a restriction due to changes in the quality of certain samples, there would be also an increase due to substitution of less stringent volatility requirements for other samples.

ADOPTION OF THE REVISED SPECIFICATION BY THE TECHNICAL COMMITTEE ON PETROLEUM SPECIFICATIONS IN OCTOBER, 1919.

The recommendations of the Bureau of Mines were carefully considered by the technical subcommittee of the committee on standardization of petroleum specifications, and on September 29, 1919, the bureau recommendations were approved by the subcommittee and referred to the main committee for official approval, which was given under date of October 23, 1919. The revised specification was adopted by some Government organizations in advance of this date, and is now in general use by various Federal departments.

ADVISABILITY OF PROVIDING FOR FUTURE REVISIONS OF GOVERNMENT SPECIFICATIONS.

The October, 1919, specification covers conditions of the motor fuel market as then foreseen, but no one expected that this specification would remain satisfactory for an indefinite period of time. However, it should serve for a period of at least two years, after which modifications might be desirable in the direction either of greater strictness or more leniency. Some provision should be made for the permanent establishment of authority for revision of this as well as other petroleum specifications; if any legislative acts are passed which include the present specification, provision should be made for changing the legislative requirements to conform with possible future revisions in this specification.

CHAPTER 3.—GASOLINE SURVEY OF 1917.

NECESSITY OF THE 1917 SURVEY.

The gasoline survey of 1917 was begun about the time the United States entered the war; its principal purpose was to obtain information regarding the grades and varieties of gasolines on the market so that intelligent and practical specifications could be written for Government purchases. The survey was amply justified on this basis alone, and the information possessed by the Bureau of Mines proved of considerable value to various Government departments during the course of the war. The results of this survey are also of interest for purposes of general information and, although not as comprehensive as those of the 1919 survey, are believed to be more reliable than anything published heretofore.

EXTENT OF THE 1917 SURVEY.

A total of 247 samples was collected during the 1917 survey. These samples came from 21 States and represented the products of practically all refineries sufficiently large to be of importance in relation to the total production of gasoline.

METHODS OF COLLECTING AND TESTING SAMPLES.

The samples were collected in much the same manner as in 1919, except that the period of collection was longer. The bulk of the samples were collected in April and May, but some States were not reached until late in the summer of 1917. The work of collecting samples was handled by field men of the bureau in connection with other work, which accounts for the sampling campaign having been less intensive than that of the later survey. On this account as well as on account of the limited nature of the survey, the results are not as conclusive as those of the 1919 survey. However, many of the omissions have been shown through the results of later work to be of negligible importance. Actually the results of the 1917 survey are more comprehensive than might be indicated by the number of samples collected. A study of the figures obtained through the 1919 survey has shown that a great many samples were collected and localities studied which failed to bring to light any new information.

The samples were analyzed according to the methods used for the 1919 survey with the following exceptions:

Color was determined simply by inspecting a column of gasoline in a test tube and not by comparing it with distilled water. This

largely accounts for the higher percentage of samples reported as water white. Many of these samples undoubtedly had a yellowish tinge which was not observed in the absence of a standard of comparison.

Odor was observed in the same manner as in the later survey, but was reported in a slightly different manner. If pleasant, it was reported as "good," or "O. K.;" if unpleasant, as "cracked" or "like kerosene."

Acidity was determined by shaking the original sample with water and testing the water extract with blue litmus paper. As none of the samples were shown to be acid, the results have not been reported. As has been already stated, this acidity test is totally inadequate, because it does not indicate the presence of acid combined with the gasoline.

The corrosion and gumming test was not made, as that test had not been developed at the time the 1917 samples were tested.

The distillation test was conducted in the same manner as in the later survey but several of the points reported for the 1919 tests were not taken in 1917. The points omitted in the earlier survey were the 5 per cent, 45 per cent, and 96 per cent marks. The fact that these marks proved to have no practical significance shows that their lack does not in any way interfere with the value of the earlier survey.

PRESENTATION OF DATA.

The scheme adopted for presenting results of the 1919 survey has been duplicated for results of the 1917 survey, the tables being divided to show differences in both refining and marketing practices. The detailed results are shown in Tables 17 and 18, at the end of this bulletin. Table 17 contains the full analytical data for each sample collected in 1917, classified according to States, and corresponds to Table 15 for the 1919 samples. Table 18, showing company differences, is similar to Table 16 for the 1919 survey, but presents relatively fewer distillation temperatures. The company numbers are the same as those used in the 1919 survey. Summary tables (Nos. 10 to 14) are presented in the following text at the places where they are discussed.

DISCUSSION OF RESULTS OF THE 1917 SURVEY ARRANGED ON THE BASIS OF GEOGRAPHIC ORIGIN OF SAMPLES.

VARIATIONS IN RETAIL PRICE.

Retail prices were not obtained for many of the samples collected in 1917, hence it is not possible to show definitely the price variations characteristic of different sections of the country. The following facts are, however, of interest. The lowest price for motor gasoline

in any of the cities represented was in Kansas City, the retail figure being 18.3 cents per gallon. The next lowest figure was for St. Louis where the general price was 18.4 cents per gallon; San Francisco was third with a figure of 20 cents. At most places a price between 22 and 25 cents prevailed, except in the Rocky Mountain district where in some of the small towns the price was as high as 45 cents. These high figures were, however, due to local conditions and more reasonable figures were obtained in larger cities. The retail price in Denver, Colo., was 25 cents, in Salt Lake City, Utah, 28 cents, and in Butte, Mont., 30 cents.

In certain cities the price situation was complicated by the fact that a number of grades of motor gasoline were being sold. In St. Louis some companies were selling four grades of gasoline designated as grades 1, 2, 3, and 4, which retailed at 23, 21.5, 19.5 and 18.4 cents, respectively. Three grades of gasoline were being sold in Pittsburgh, the grade designated as "74-76° gasoline" selling for 32 cents, a so-called "68-70° gasoline" at 27 cents, and "motor" gasoline at 25 cents. In practically all the other cities in which samples were collected only a single grade of motor gasoline was extensively marketed, although the gasoline sold under this grade varied widely in quality. Also, frequently the retail price of the same grade of gasoline differed among different retailers. This variation was largely due to the different types of selling station; for instance, garages usually charged higher prices than those maintained at filling stations. Table 12 (p. 96), which gives prices in effect in different cities in 1917 and 1919, shows the variation among different cities, as well as the variation between the years 1917 and 1919, which is discussed in a later connection.

COLOR, ODOR, AND PERCENTAGE OF UNSATURATION.

Results of tests for color, odor, and percentage of unsaturation of samples collected in 1917 appear in Table 17 (p. 244). Study of the data does not reveal any differences in these properties that could be considered characteristic of marketing practice of particular localities. These tests are discussed subsequently in connection with the marketing practice of various companies.

GRAVITY.

None of the samples collected in 1917 contained an appreciable proportion of benzol or other coal-tar distillates, as at that time coal-tar products were in too much demand for other purposes to be marketed as motor fuel. The gravity measurements are useful, therefore, simply for showing the character of the crude oil from which different samples of gasoline were refined.

Gravities of samples included in the series range from 48.3° B. (specific gravity, 0.785), for an engine distillate from California, to 74.7° B. (specific gravity, 0.684), for a blend of casing-head gasoline and refinery gasoline from Pennsylvania. Gravities of the average grades of motor gasoline produced from different typical crudes were approximately as follows:

Gravities of average motor gasoline produced from typical crudes.

Type of crude	Gravity of gasoline.	
	Degrees Baumé.	Specific gravity.
Pennsylvania.....	60.5 to 64.4	0.735 to 0.720
Mid-Continent.....	56.9 to 61.3	.749 to .732
California.....	56.4 to 58.4	.751 to .734

In each district the products of higher gravity (so-called "high test" gasoline) were sold usually at prices 2 to 7 cents above the current figure for "motor" gasoline.

Products of the same volatility obtained from the various crudes show the same general differences in gravity as are shown in Table 5, for the 1919 series. The number of samples obtained from refineries using a single grade of known origin is so small that differences in gravity can not be illustrated so well as could be done for samples collected in 1919.

SPECIFIC FEATURES OF VOLATILITY TESTS.

Distillation tests show a wide variation in the volatility of samples collected in 1917. Initial boiling points range between extremes of 26° C. (79° F.) and 87° C. (189° F.). Practically all samples with initial boiling points below 40° C. (104° F.) contained casing-head gasoline. Products with initial boiling points above 75° C. (167° F.) should properly have been classed as naphthas rather than gasolines.

The 20 per cent marks range from 49° C. (120° F.) to 130° C. (266° F.). Fifty per cent marks range from 81° C. (178° F.) to 160° C. (320° F.). Ninety per cent marks vary between 124° C. (255° F.) to 230° C. (446° F.). Dry points were as low as 156° C. (313° F.) and as high as 250° C. (482° F.). A large percentage of the samples had distillation marks which can be summarized by the following limits:

	Degrees centigrade.	Degrees Fahrenheit.
Initial boiling points.....	45 to 55	113 to 131
20 per cent marks.....	85 to 95	185 to 203
50 per cent marks.....	115 to 130	239 to 266
90 per cent marks.....	165 to 185	329 to 365
Dry points.....	190 to 210	374 to 410

The proportion of samples showing figures above or below these limits was relatively small. Average boiling points for the samples ranged from 85° to 166° C. (185° to 331° F.). A large proportion of the samples, however, had average boiling points between 115° and 130° C. (239° and 266° F.). Average boiling points for all samples was 122° C. (252° F.).

The distillation losses ranged up to 5 per cent, samples with losses of more than 2 per cent generally being casing-head blends. The

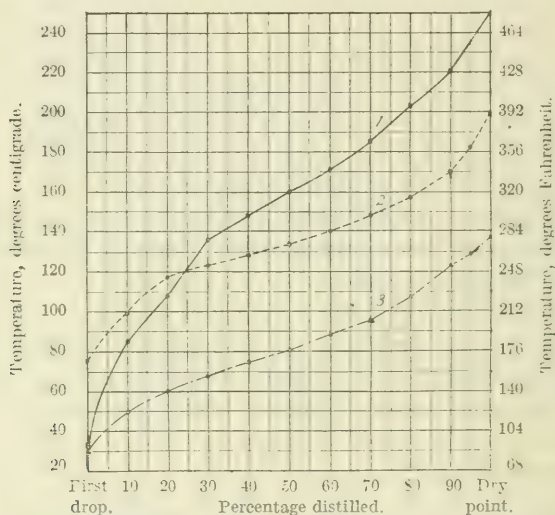


FIGURE 16.—Distillation curves of three widely different types of petroleum-derived motor fuels. 1, sample 55, gravity 58.7° B., blend of casing-head gasoline and kerosene; 2, sample 226, gravity 53° B., naphtha from Healdton, Okla., crude; 3, sample 193, gravity 74.1° B., "high-test" gasoline.

average distillation loss for "straight-run" products was between 1 and 2 per cent.

A study of the distillation tests showed that the samples ranged from a so-called 74 – 76° gasoline to a relatively inferior type of motor fuel made by blending casing-head gasoline and kerosene. Sample 193 was a product of practically the same volatility as gasoline used as airplane fuel, but contained volatile fractions that would have to be removed in order to pass the requirements for the export grade of aviation gasoline, which was the grade generally used in combat planes. Sample 226 was a naphtha made from Healdton, Okla., crude, and corresponded in volatility to sample 133, a California engine distillate. Sample 55 was a blend of casing-head gasoline and kerosene. Distillation curves of these three types of products (samples 193, 226, and 55) are shown in figure 16.

AVERAGE DISTILLATION FIGURES FOR VOLATILITY OF GASOLINE COLLECTED IN EACH STATE.

Table 10 shows average distillation figures representative of the series of samples collected in each State in the 1917 survey. The gasolines sold in the State of California were of higher volatility than those sold in any other State, which was also true of the series collected in 1919. The average grade of gasoline sold in the State of Kentucky showed a lower volatility than that sold in any other State covered by the 1917 survey. This is explained by the fact that a relatively high percentage of the Kentucky samples was products containing "heavy ends," generally from the use of high-boiling naphtha for blending with casing-head gasoline. The volatility of the samples obtained from some States, as Pennsylvania and Missouri, is somewhat higher than might have been expected, but is evidently due to the relatively large percentage of samples of "high test" gasoline collected in these States. If the special "high test" products are excluded, the average grade of gasoline collected in Pennsylvania and Missouri was about the same as that sold in the respectively adjacent States of Ohio and Illinois. The average distillation curve for the samples collected in Oklahoma shows a high degree of volatility, largely because a number of them represent products manufactured for export or other special purposes.

The limited number of States covered by the 1917 survey does not permit giving satisfactory figures characteristic of different sections of the country. However, sectional differences are fairly well illustrated by the distillation figures characteristic of three States which represent typical districts. There is little doubt that the series of samples collected in Massachusetts, Illinois, and California are representative, respectively, of the New England, the Middle Western, and the Pacific coast districts, this having been demonstrated by analogous figures from the 1919 survey. No series of samples was obtained for any State in the Rocky Mountain district which satisfactorily represented the average quality of gasoline marketed in that district. Southeastern States were not covered by the 1917 survey, but it is believed that the grade of gasoline sold there was practically the same as that marketed in New England, this having been demonstrated by the 1919 survey. Curves characteristic of the New England, Middle Western, and Pacific coast districts appear in figure 17, and show the same general difference in volatility as that found in the later survey.

TABLE 10.—Data showing average distillation ranges of samples collected from each State in the 1917 gasoline survey.

State.	Number of samples.	Distillation. ¹					
		Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	Average boiling point.
Alabama.....	16	{ 117 47	{ 205 96	{ 252 122	{ 336 169	{ 399 204	{ 255 124
Arkansas.....	2	{ 104 40	{ 203 95	{ 257 125	{ 347 175	{ 428 220	{ 261 127
California.....	17	{ 108 42	{ 187 86	{ 225 107	{ 298 148	{ 352 178	{ 226 108
Colorado.....	14	{ 122 50	{ 199 93	{ 253 123	{ 360 182	{ 417 214	{ 261 127
Illinois.....	11	{ 113 45	{ 201 94	{ 262 128	{ 356 180	{ 414 212	{ 262 128
Kentucky.....	7	{ 108 42	{ 212 100	{ 271 133	{ 360 187	{ 432 222	{ 277 136
Louisiana.....	7	{ 120 49	{ 212 100	{ 264 129	{ 352 178	{ 412 211	{ 266 130
Maine.....	6	{ 124 51	{ 201 94	{ 250 121	{ 324 162	{ 372 189	{ 250 121
Maine.....	1	{ 140 60	{ 217 103	{ 264 129	{ 338 170	{ 381 194	{ 264 129
Massachusetts.....	15	{ 124 51	{ 205 96	{ 252 122	{ 331 166	{ 381 194	{ 253 123
Michigan.....	5	{ 129 54	{ 214 101	{ 255 124	{ 347 175	{ 415 213	{ 264 129
Missouri.....	23	{ 126 52	{ 203 95	{ 250 121	{ 345 174	{ 408 209	{ 257 125
Montana.....	12	{ 124 51	{ 198 92	{ 246 119	{ 342 172	{ 401 205	{ 253 123
Nevada.....	4	{ 142 61	{ 207 97	{ 241 116	{ 313 156	{ 369 187	{ 246 119
New York.....	8	{ 126 52	{ 201 94	{ 243 117	{ 325 163	{ 385 196	{ 248 120
Ohio.....	26	{ 126 52	{ 203 95	{ 253 123	{ 345 174	{ 405 207	{ 259 126
Oklahoma.....	15	{ 124 51	{ 196 91	{ 234 112	{ 311 155	{ 369 187	{ 239 115
Pennsylvania.....	13	{ 109 43	{ 178 81	{ 230 110	{ 327 164	{ 385 196	{ 235 113
Tennessee.....	8	{ 120 49	{ 205 96	{ 250 121	{ 347 175	{ 412 211	{ 255 124
Texas.....	25	{ 126 52	{ 207 97	{ 252 122	{ 338 170	{ 399 204	{ 257 125
Utah.....	18	{ 127 53	{ 199 93	{ 239 115	{ 315 157	{ 367 186	{ 244 118
Average distillation, all samples.....	247	{ 122 50	{ 201 94	{ 248 120	{ 334 168	{ 394 201	{ 252 122

¹ For each group the upper line gives the temperatures in degrees Fahrenheit, and the lower line in degrees centigrade.

DISCUSSION OF RESULTS WITH REGARD TO REFINING AND MARKETING PRACTICES.

Table 18 shows figures obtained in the 1917 survey arranged in the same manner as those for the 1919 survey, which appear in Table 16. The classification of companies is the same as that adopted for the later survey. However, of the 23 companies included in the later survey under the heading of large refiners, 3 are not represented in the 1917 survey. A number of the small refiners and jobbers represented in the 1919 survey are also missing from the earlier survey. On the other hand, some of the companies from which samples were obtained in 1917 are not represented in the 1919 series. This was largely because certain companies had gone out of business,

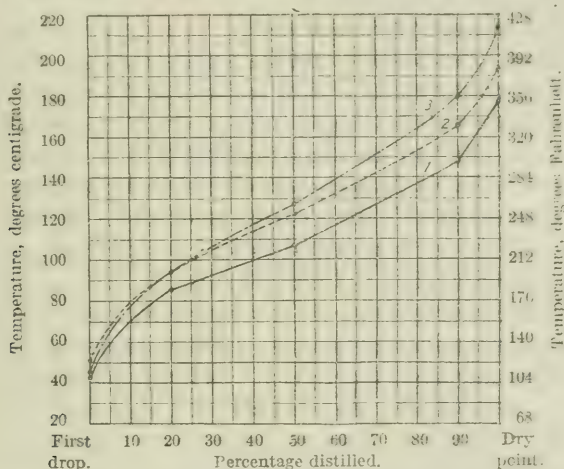


FIGURE 17.—Average distillation curves for samples of gasoline collected in 1917 in three States representative of different parts of the country. 1, California; 2, Massachusetts; 3, Illinois.

others had changed names, or had been affiliated with other organizations.

COLOR CHARACTERISTIC OF PRODUCTS OF DIFFERENT COMPANIES.

Practically all samples for the 1917 survey were reported as "water white," and none of the different products examined seemed to show any noticeable superiority over others. This may have been in large degree due to the less stringent nature of the color comparison.

ODOR CHARACTERISTIC OF PRODUCTS OF DIFFERENT COMPANIES.

A number of samples from companies marketing gasoline of relatively high degree of unsaturation were reported as having an "aromatic" or "cracked" odor. A few samples had odors similar to that of kerosene. Others were reported as "good" or "O. K."

UNSATURATION CHARACTERISTIC OF PRODUCTS OF DIFFERENT COMPANIES.

A large percentage of the samples were reported as being less than 1 per cent unsaturated. The unsaturation tests for the earlier survey were made by a method slightly different from that employed in 1919. Each sample of gasoline was shaken with two volumes of sulphuric acid; if no color or a slight yellow color developed, no measurement of the volume absorbed was made and the sample simply reported as less than 1 per cent unsaturated. This procedure was adopted because previous experiments had indicated that unless a decided yellow or red color developed, less than 1 per cent of the gasoline would dissolve in acid.

Those samples showing marked yellow or reddish colors were subjected to the usual quantitative test for unsaturation. Some of these samples gave an unsaturation test of as high as 6 per cent, indicating a content of approximately 25 per cent of cracked constituents, and a number of them showed an unsaturation of 3 to 4 per cent, indicating a content of 12 to 18 per cent of cracked distillates.

Figures characteristic of the average content of unsaturated hydrocarbons in the products of the different companies appear in columns 2 and 3 of Table 11. Column 2 gives the average percentage of unsaturation characteristic of the products marketed by each company, this average including both the figures determined exactly and those rated as less than 1 per cent. A large majority of both the large refiners, small refiners, and jobbers are represented by figures of the order of 1 per cent. A better plan of representing the degree to which the various companies were employing cracking processes is to show for each company the percentage of samples that were more than 1 per cent unsaturated. This has been done in column 3. All the samples obtained from companies 3 and 21 were more than 1 per cent unsaturated, while all the samples from 11 companies were less than 1 per cent unsaturated. The other companies are represented by figures varying from 7 to 50 per cent.

TABLE 11.—Data showing averages of analytical results for the samples collected from different companies in the 1917 survey.

A. LARGE REFINERS AND MARKETERS.

Company No.	Unsaturation.		"Doctor" test. (Percent- age of samples passing test.)	Distillation. ¹					
	Average, per cent.	Percent- age of samples more than 1 per cent unsat- urated.		Initial boil- ing point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	Average boil- ing point.
1.....	1.5	30	91	{ 122 50	207 97	206 130	351 177	408 209	262 128
2.....	1—	7	100	{ 120 49	201 94	244 118	333 167	397 203	252 122
3.....	4.7	100	80	{ 104 49	214 101	279 137	378 192	430 221	277 136
4.....	1—	0	33	{ 138 59	207 97	250 121	338 170	397 203	257 125
5.....	3.0	33	33	{ 126 52	203 95	250 121	325 163	374 190	250 121
6.....	1—	0	43	{ 117 47	207 97	262 128	356 189	419 215	264 129
8.....	1—	0	100	{ 124 51	198 92	246 119	340 171	396 202	252 122
9.....	1—	0	100	{ 126 52	201 94	244 118	340 171	412 211	253 123
10.....	2.7	31	69	{ 122 50	199 93	248 120	342 172	394 201	253 123
12.....	2.0	50	100	{ 115 46	205 96	257 125	354 179	419 215	261 127
13.....	1—	0	100	{ 133 56	198 92	239 110	297 147	352 178	232 111
14.....	1—	0	100	{ 109 43	185 85	226 108	302 150	360 182	230 110
15.....	1—	0	100	{ 118 48	203 95	248 120	327 164	396 199	250 121
16.....	1—	0	100	{ 120 49	199 93	232 111	289 143	334 169	232 111
17.....	1—	0	100	{ 120 54	223 106	252 122	318 159	363 184	252 122
18.....	1—	0	100	{ 122 50	178 81	223 106	309 154	372 189	230 110
19.....	1—	0	100	{ 120 49	181 83	208 98	270 132	331 166	214 101
21.....	3.0	100	100	{ 106 41	183 84	239 115	327 164	365 185	239 115
22.....	2.1	75	100	{ 111 44	196 91	271 133	374 190	414 212	268 131
Averages of 124 samples from 19 companies.....				{ 122 50	201 94	252 122	336 169	394 201	253 123

B. SMALL REFINERS.

Averages of 48 samples from 34 companies.....	1.4	8	90	{ 126 52	201 94	244 118	325 163	383 195	248 120
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C. JOBBERS.

Average of 75 samples from 50 companies.....	1.3	9	54	{ 120 49	199 93	248 120	333 170	397 203	252 122
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¹ For each group, the upper line of figures is in Fahrenheit degrees, the lower line is in centigrade degrees.

"DOCTOR" TESTS CHARACTERISTIC OF PRODUCTS OF THE DIFFERENT COMPANIES.

The percentage of samples from each company passing the "doctor" test is given in column 4 of Table 11. Only four of the larger companies had relatively high percentages of products not passing the "doctor" test, and practically all products sold by small refiners and jobbers passed the test.

In this table all samples for which the result of the test was reported as questionable are considered as passing, this being in accord with the interpretation of the test that is now accepted.

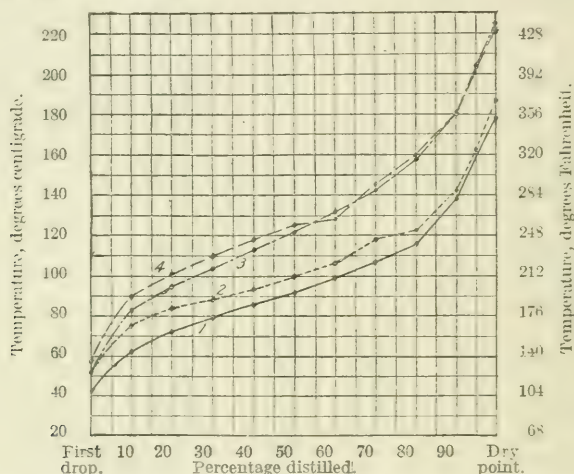


FIGURE 18.—Distillation curves for four different grades of gasoline marketed by one company in St. Louis, Mo., in 1917. 1, grade 1; 2, grade 2; 3, grade 3; 4, grade 4.

VOLATILITY CHARACTERISTIC OF PRODUCTS OF DIFFERENT COMPANIES.

As a rule, each company represented in the 1917 survey marketed a characteristic grade of gasoline in all sections of the country in which the company was represented; very few companies seemed to have prepared their gasoline to conform with the standards of different sections. In spite of the characteristic differences in volatility for the various sections of the country, companies marketing in more than one section generally maintained a uniform grade; this, of course, holds only for the so-called "motor" gasoline and not for "high-test" products which were produced in relatively small quantity.

Sometimes the statement is made that companies marketing several grades of gasoline actually supply only one grade but sell under different ratings in order to satisfy their customers. Results of the 1917 survey showed conclusively that this is untrue and that the products rated under different grades by each company were actually different. This is illustrated by the distillation curves in figure 18 for four grades of gasoline sold in St. Louis by company 9.

These grades, which were designated as Nos. 1 to 4, sold, respectively, for 23, 21.5, 19.5, and 18.4 cents per gallon. Grades 3 and 4 had only a slight difference in volatility but their gravities differed about 1°B. , which was a characteristic difference according to the commercial method of rating gasoline in vogue at the time of the 1917 survey.

Average distillation figures for the series of samples obtained from each of the large companies and from the small refiners and jobbers are given in Table 11. Several of the companies are represented by a relatively small number of samples and a few of the companies are represented by series including a relatively large proportion of "high-test" samples. Therefore, the table is not as satisfactory for comparing the refining practice of different companies as is Table 9

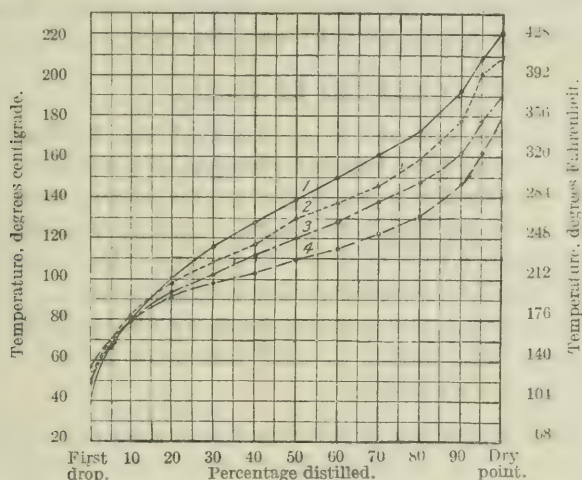


FIGURE 19.—Average distillation curves for the series of samples representing four of the larger companies in the 1917 survey. 1, company 3; 2, company 1; 3, company 5; 4, company 13.

(p. 72), which presents similar figures for the 1919 survey. A number of the companies are, however, satisfactorily represented.

The average distillation ranges for the products marketed by jobbing concerns were practically identical with the averages characteristic of those marketed by some of the large refiners; the small refiners generally marketed products of a somewhat higher range of volatility (lower range of boiling points). This difference is largely due to the fact that a relatively greater proportion of "high-test" products are made by the small refiners. Comparison of the curves in figure 19 for the distillation of samples representative of four refining companies show noteworthy differences, especially as regards constituents of relatively high boiling point. The maximum difference at the 90 per cent point is 45°C. (81°F.). As the figures for the four curves do not include any for special products, the curves are probably typical of the average grade of motor gasoline sold by each of these companies in 1917.

CHAPTER 4.—COMPARISON OF RESULTS OBTAINED BY THE 1917 AND 1919 SURVEYS.

PURPOSE.

In chapter 2 the results obtained in the 1919 gasoline survey are discussed, and the comparative difference in price and quality shown for products sold in different States and by different companies. Chapter 3 includes a similar discussion of the results of the 1917 survey. The purpose of chapter 4 is to show the extent to which prices and quality of motor fuel have changed during the two-year period between the spring of 1917 and the spring of 1919.

CHANGES IN PRICE.

It has been shown (see fig. 7. p. 23) that the wholesale price of gasoline in New York City has not changed appreciably since 1916. Retail prices are usually 2 cents per gallon higher than wholesale figures, hence it is justifiable to assume similar constancy for the retail prices of motor fuel in New York City. However, this constancy in price for the two-year period evidently has not been maintained in other cities in the country, as is shown by Table 12, which contains average retail prices in 1917 and 1919 for all cities which were covered by both surveys.

TABLE 12.—*Showing retail prices of motor gasoline in cities visited in the 1917 and 1919 gasoline surveys.*

State.	City.	Retail price, cents per gallon.		State.	City.	Retail price, cents per gallon.	
		1917	1919			1917	1919
Alabama.....	Birmingham.....	26	26.5	Montana.....	Butte.....	30	.....
California.....	San Francisco.....	20	20.5	Do.....	Missoula.....	25	29
Colorado.....	Denver.....	25	28	New York.....	Buffalo.....	25	26
Illinois.....	Chicago.....	21	23	Ohio.....	Cleveland.....	24	23.5
Kentucky.....	Louisville.....	24	25.5	Oklahoma.....	Tulsa.....	24	22.5
Louisiana.....	New Orleans.....	22.5	23	Pennsylvania.....	Pittsburgh.....	25	27
Maine.....	Portland.....	26	27.5	Tennessee.....	Nashville.....	23	.....
Massachusetts.....	Boston.....	25	27.5	Do.....	Chattanooga.....	22	24
Michigan.....	Detroit.....	20	23.7	Texas.....	Dallas.....	22	24.5
Missouri.....	St. Louis.....	18.4	22.4	Do.....	Houston.....	22	21.5
Do.....	Kansas City.....	18.3	22.3	Utah.....	Salt Lake City.....	28	27

¹ Estimated. Retail prices were not obtained at the time of sampling, but price reviews in oil journals indicate that the filling station price in April, 1917, was 20 cents per gallon.

² Samples were collected the first week of March, 1917, which probably accounts for the relatively low retail price, as Detroit prices are usually about $\frac{1}{2}$ cent higher than those in Chicago.

In two cities included in the list—Tulsa, Okla., and Salt Lake City, Utah—the average retail price for motor gasoline was lower in April,

1919, than in April, 1917. The prevailing retail price in Tulsa was 24 cents in 1917 and 22.5 cents in 1919. The latter price was, however, maintained only by the larger companies; a number of the smaller organizations were charging 23.5 cents. In Salt Lake City the average retail price of 1917 was 28 cents, whereas in 1919 most of the samples collected represented products which were being sold at retail stations for 27 cents. In the majority of cities, however, the price of gasoline had tended to increase in the two-year period, the range of variation being generally between one-half and 2 cents per gallon. The largest increases in retail price occurred in Kansas City, Mo., and St. Louis, Mo., where the advance for ordinary grades of gasoline was about 4 cents per gallon. In Denver, Colo., there was an advance of 3 cents; in Boston, Mass., $3\frac{1}{2}$ cents; in Dallas, Tex., $2\frac{1}{2}$ cents; other advances being, as has already been indicated, from one-half to 2 cents a gallon. In connection with the changes in price, it is desirable to comment upon corresponding changes in volatility of gasoline. In cities where the price was practically unchanged there was a decided lowering in volatility, whereas in the cities having relatively greater increases in price the volatility of the motor fuel remained practically the same. This relation does not hold strictly and there is a notable exception as regards California gasoline, but in general there appears to be a rather close relation between price and volatility.

CHANGES IN COLOR.

A high percentage of the samples collected in 1919 were reported as "slightly yellow" or "yellowish," very few being reported as "water white." For the 1917 survey practically all samples were reported as "water white." This difference is partly due to the less rigid standard of comparison employed in the earlier survey, but the writers believe that there has been a decided tendency toward marketing gasoline that has been less carefully refined to produce a water-white color. This is not, however, regarded by the bureau as in the nature of a deterioration, as the property of color has little significance in determining the behavior of motor fuel in actual service.

CHANGES IN ODOR.

As regards the property of odor, the gasolines being marketed have changed appreciably in the two-year period of 1917 to 1919. In the later survey relatively few samples had a sweet odor, such as is characteristic of "high test" straight-run products. A large number of the samples were reported as of "poor" or "bad" odor, whereas only a few of those collected in 1917 had unpleasant odors. This difference is probably due in large measure to the increased use of

blends containing either casing-head gasoline or cracked gasoline, although it may be attributed in part to the raising of end points. Gasolines of high end point have odors similar to those of kerosene.

CHANGES IN "PERCENTAGE OF UNSATURATION."

The 1919 samples, compared with those for 1917, show a decided increase in the number containing constituents soluble in sulphuric acid. Of the samples collected in 1917, comparatively few had "percentages of unsaturation" higher than 1 per cent, whereas in 1919 comparatively few were as low as 1 per cent "unsaturated." This difference is not entirely due to the wider use of cracking processes, as a relatively large number of products which were known to be of the "straight" refinery type contained 1.5 to 2.5 per cent of material soluble in sulphuric acid. This difference parallels that observed for color, and indicates that refiners were not treating their products as much with sulphuric acid in 1919 as in 1917. Like the change in color, this change in unsaturation should not be regarded as a deterioration, because freedom from unsaturated products is not essential.

An important fact to be noted is that companies operating cracking processes in 1917 were marketing gasolines in 1919 decidedly higher in cracked constituents. The maximum figure for "percentage unsaturation" in 1917 was generally about 6 per cent, whereas in 1919 corresponding figures even run as high as 12 per cent. This indicates that the quantity of gasoline produced by the cracking processes has practically doubled during the two-year period. The following examples show increases in average percentage of unsaturation of products marketed by different refining companies:

Examples showing increases in average percentage of unsaturation of gasolines marketed by 8 companies.

Company No.	Average percentage of unsaturation.	
	1917	1919
5.....	4.7	8.4
8.....	3.0	5.7
8.....	(1)	3.8
19.....	2.7	5.7
12.....	2.0	5.8
13.....	(1)	3.7
17.....	(1)	6.3
21.....	2.1	5.4

¹ Less than 1.

As has been stated before, the content of cracked constituents is proportional to the percentage of unsaturation, and the experience of the bureau's chemists has indicated that an ordinary unrefined

cracked distillate is about 25 per cent soluble in sulphuric acid. The percentage of cracked constituents in the average products of different companies may be estimated by multiplying their respective "percentages of unsaturation" by 4.

CHANGES IN PERCENTAGES OF SAMPLES PASSING THE "DOCTOR" TEST.

Of the samples collected in 1917, 85 per cent passed the "doctor" test as against 71 per cent of the samples collected in 1919. This may be due in part to the general increase in end point, as products of low volatility tend to be "sour" to the doctor reagent.

The difference with regard to this test is more noticeable on comparing the refining practice of individual companies. Companies represented in 1917 by samples, a large proportion of which tested positive or "sour," also showed a large percentage of "sour" samples in 1919. For example, 67 per cent of the products collected from company 5 in 1917 were "sour" and 58 per cent were "sour" in 1919. Company 6 had 57 per cent "sour" in 1917 and 88 per cent "sour" in 1919. Company 10 had 31 per cent "sour" in 1917 and 24 per cent "sour" in 1919. A number of companies having 100 per cent of their samples "sweet" in 1917 had considerably lower percentages "sweet" in 1919. For example, companies 2, 8, 9, and 12 had the percentage of samples passing the "doctor" test fall from 100 per cent to 67, 65, 89, and 70 per cent, respectively. Only three companies, 13, 16, and 21, had 100 per cent of samples "sweet" to the "doctor" test in both years.

CHANGES IN GRAVITY.

There was a notable tendency toward the lowering in Baumé gravity of products during the two-year period. This was due partly to the increased use of benzol and other coal-tar distillates, but more largely to the decrease in volatility (increase in boiling range). The following table shows general changes in gravity for gasolines produced from typical crudes during the two-year period.

Changes in gravity of gasolines produced from three typical crudes.

Type of crude.	Gravity in 1917.		Gravity in 1919.	
	°B.	Specific gravity.	°B.	Specific gravity.
California	56.4 to 59.4	0.751 to 0.739	53 to 55	0.745 to 0.757
Mid-Continent	57 to 61	.749 to .733	55 to 58	.757 to .745
Pennsylvania	61 to 64	.733 to .723	59 to 63	.741 to .726

The Baumé gravity was, therefore, lowered by an average of 2 to 3 degrees between 1917 and 1919.

CHANGES IN VOLATILITY.

Table 1 (p. 9) shows that in 1916 the yield of gasoline per 42-gallon barrel of crude oil refined was 8.3 gallons. In 1917 the yield per barrel had increased to 9.1 gallons and in 1918 to 11 gallons. As formerly stated, this increased yield was partly due to a more general use of casing-head gasoline and wider employment of cracking processes, and partly to changes in the volatility limits.

Figure 20 shows curves representing average distillation temperatures for all the samples collected in 1917 and all those collected in 1919. The curves practically coincide up to the 20 per cent mark, showing that the percentage of relatively volatile constitu-

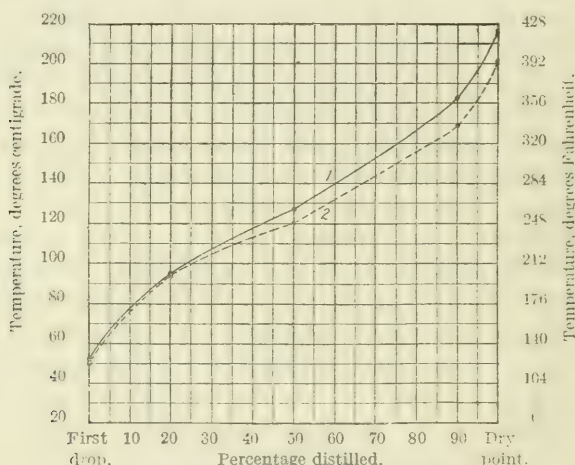


FIGURE 20. Average distillation curves for the series of samples representing the 1917 and 1919 gasoline surveys; 1, 1919 survey; 2, 1917 survey.

ents has remained constant over the period of two years, undoubtedly from the increased production and use of casing-head gasoline. Above the 20 per cent mark the curves diverge, the average distillation temperature at the various marks being higher for the 1919 than for the 1917 curves. At the 50 per cent point this difference amounts to 7°C . (13°F .); at the 90 per cent point, 15°C . (27°F .), and at the dry point, 16°C . (29°F .).

The curves show conclusively that although the refiners have increased the proportion of high-boiling material in their gasoline, they have at the same time maintained the content of volatile material practically constant. From this it follows that the starting qualities of the average motor fuel of 1919 are only slightly, if at all, inferior to those of the average product of 1917.

CHANGES IN VOLATILITY IN DIFFERENT SECTIONS OF THE COUNTRY.

Table 13 shows average distillation figures for all the samples collected in each of the 20 States covered by both the 1917 and 1919 surveys. In one State, Ohio, practically no change is noted. This does not prove that the general grade of gasoline sold in that State has remained unchanged, because the proportion of high-test products sampled in 1919 was greater than in 1917. However, the general change in volatility was perhaps relatively less in Ohio than in many of the other States. Also, relatively small changes were shown for Louisiana, Illinois, Texas, and Kentucky.

TABLE 13. *Data showing comparison of volatilities of gasolines marketed in 1917 and 1919.*

AVERAGE DISTILLATION OF SAMPLES COLLECTED FROM 20 STATES.

State.	Year.	Average distillation. ¹				
		Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.
Alabama.....	1917	{ 117 47	{ 205 96	{ 252 122	{ 336 169	{ 399 204
Do.....	1919	{ 129 54	{ 212 100	{ 266 130	{ 365 185	{ 424 218
Arkansas.....	1917	{ 104 40	{ 203 95	{ 257 125	{ 347 175	{ 428 220
Do.....	1919	{ 127 53	{ 207 97	{ 271 133	{ 372 189	{ 428 220
California.....	1917	{ 108 42	{ 187 86	{ 225 107	{ 298 148	{ 352 178
Do.....	1919	{ 133 56	{ 205 96	{ 244 118	{ 329 165	{ 392 200
Colorado.....	1917	{ 122 50	{ 199 93	{ 253 123	{ 360 182	{ 417 214
Do.....	1919	{ 126 52	{ 207 97	{ 271 133	{ 381 194	{ 435 224
Illinois.....	1917	{ 113 45	{ 201 94	{ 262 128	{ 356 180	{ 414 212
Do.....	1919	{ 120 49	{ 199 93	{ 264 129	{ 374 190	{ 433 22
Kentucky.....	1917	{ 108 42	{ 212 100	{ 271 133	{ 369 187	{ 432 222
Do.....	1919	{ 120 49	{ 203 95	{ 271 133	{ 388 198	{ 444 229
Louisiana.....	1917	{ 120 49	{ 212 100	{ 264 129	{ 352 178	{ 412 211
Do.....	1919	{ 126 52	{ 216 102	{ 270 132	{ 369 187	{ 426 219
Maine.....	1917	{ 124 51	{ 201 94	{ 250 121	{ 324 162	{ 372 189
Do.....	1919	{ 126 52	{ 207 97	{ 262 128	{ 360 182	{ 410 210
Maryland.....	1917	{ 140 60	{ 217 103	{ 264 129	{ 338 170	{ 381 194

¹ For each distillation the upper line shows temperatures in Fahrenheit degrees, and the lower line temperatures in degrees centigrade.

102 QUALITY OF GASOLINE MARKETED IN UNITED STATES.

TABLE 13.--Data showing comparison of volatilities of gasolines marketed in 1917 and 1919--Continued.

AVERAGE DISTILLATION OF SAMPLES COLLECTED FROM 20 STATES--Continued.

State.	Year.	Average distillation.				
		Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.
Maryland.....	1919	{ 142 61	{ 210 99	{ 259 126	{ 379 188	{ 433 223
Massachusetts.....	1917	{ 124 51	{ 205 96	{ 252 122	{ 331 166	{ 381 194
Do.....	1919	{ 127 53	{ 205 96	{ 257 125	{ 358 181	{ 412 211
Michigan.....	1917	{ 129 54	{ 214 101	{ 255 124	{ 347 175	{ 415 213
Do.....	1919	{ 117 47	{ 201 94	{ 268 131	{ 378 192	{ 435 224
Missouri.....	1917	{ 126 52	{ 203 95	{ 250 121	{ 345 174	{ 408 209
Do.....	1919	{ 131 55	{ 207 97	{ 266 130	{ 376 191	{ 432 222
Montana.....	1917	{ 124 51	{ 198 92	{ 246 119	{ 342 172	{ 401 205
Do.....	1919	{ 133 56	{ 212 100	{ 273 134	{ 396 202	{ 453 234
New York.....	1917	{ 126 52	{ 201 94	{ 243 117	{ 325 163	{ 385 196
Do.....	1919	{ 131 55	{ 205 96	{ 255 124	{ 358 181	{ 415 213
Ohio.....	1917	{ 126 52	{ 203 95	{ 253 123	{ 345 174	{ 405 207
Do.....	1919	{ 120 49	{ 196 91	{ 250 121	{ 351 177	{ 414 212
Oklahoma.....	1917	{ 124 51	{ 196 91	{ 244 112	{ 311 155	{ 369 187
Do.....	1919	{ 131 55	{ 210 99	{ 266 130	{ 370 188	{ 424 218
Pennsylvania.....	1917	{ 109 43	{ 178 81	{ 230 110	{ 327 164	{ 385 196
Do.....	1919	{ 113 45	{ 190 88	{ 252 122	{ 358 181	{ 408 209
Tennessee.....	1917	{ 120 49	{ 205 96	{ 250 121	{ 347 175	{ 412 211
Do.....	1919	{ 126 52	{ 208 98	{ 270 132	{ 378 192	{ 433 223
Texas.....	1917	{ 126 52	{ 207 97	{ 252 122	{ 338 170	{ 399 204
Do.....	1919	{ 127 53	{ 203 95	{ 253 123	{ 358 181	{ 417 214
Utah.....	1917	{ 127 53	{ 199 93	{ 239 115	{ 315 157	{ 367 186
Do.....	1919	{ 113 45	{ 207 97	{ 279 137	{ 406 208	{ 442 228
AVERAGE OF ALL SAMPLES.						
20 States.....	1917	{ 122 50	{ 201 94	{ 248 120	{ 334 168	{ 394 201
Do.....	1919	{ 126 52	{ 203 95	{ 261 127	{ 361 183	{ 423 217

Utah is a striking example of a State where the average boiling range of gasoline has increased considerably in the two-year period. The average initial boiling point of the 1919 series of samples was lower than that of the 1917 series, but all the other points were appreciably higher, the maximum difference being at the 90 per cent mark, which was 51°C . (91°F .) higher than in the 1917 survey. This decided change in volatility is accounted for by the fact that in 1917, 13 of the 18 samples came from California crude, whereas in

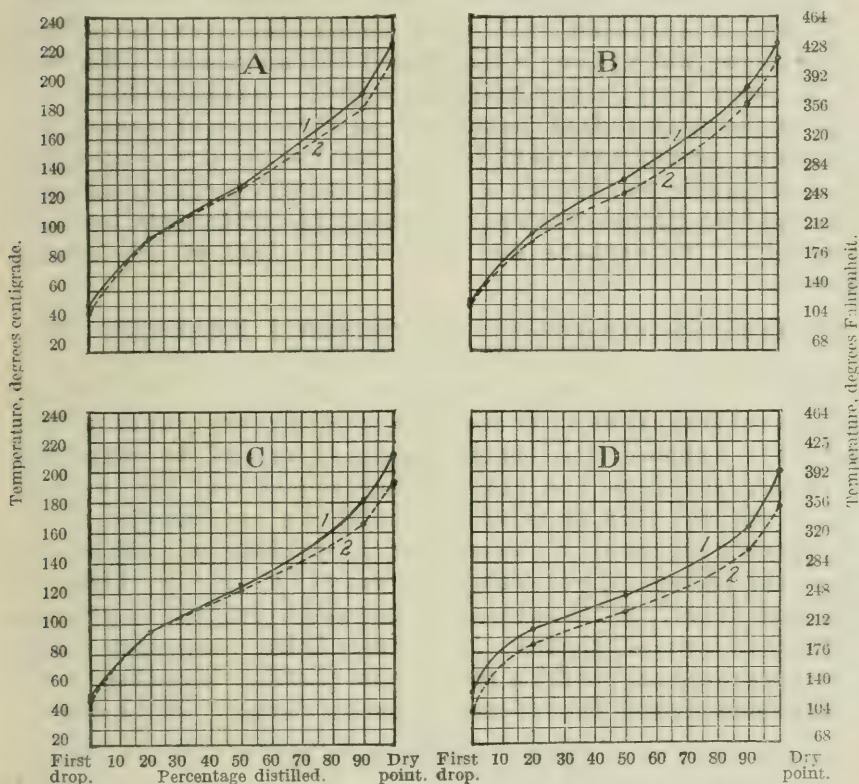


FIGURE 21.—Curves showing comparative distillation of gasolines marketed in 1917 and 1919 in four States representative of general sections of the country. A, Illinois; B, Colorado; C, Massachusetts; D, California. In each group, curve 1 represents the 1919 and curve 2 the 1917 survey.

1919 all the samples came from crude produced in the Rocky Mountain field.

The series of samples collected in Oklahoma in 1919 shows a noticeably higher average distillation range than those collected in 1917. This was largely because a number of special products, prepared to meet export requirements, were represented in 1917, but there is also a noticeable difference in the volatility of samples sold for domestic consumption. The average distillation ranges of samples

collected in Montana were also appreciably higher in 1919 than in 1917, the difference at the 90 per cent point being 30° C. (54° F.).

In most of the other States the changes in distillation range correspond fairly closely to the average change observed for results of all samples collected in four States representing different sections of the country, namely, New England, the Middle-Western States, the Rocky Mountain States, and the Pacific Coast States. Average distillation curves for these four sections are shown in figure 21. It will be observed that the two curves for samples collected from California in 1919 and 1917 differ appreciably throughout their entire course, while those for the other States show slight differences at the lower temperatures and progressively increasing differences between the upper ends of the curves. In all instances the maximum differences are either at the 90 per cent mark or the dry point, showing that greater percentages of volatile material (casing-head gasoline) had been marketed as well as high-boiling constituents, formerly included in the naphtha and kerosene fractions of the refining processes.

CHANGES IN VOLATILITY OF PRODUCTS MARKETED BY DIFFERENT COMPANIES.

Table 14 shows the average distillation ranges of the two series of samples collected from 14 of the large marketing companies in 1917 and 1919. Evidently the refining practice of some of the companies, as regards volatility, had changed decidedly during the two-year period, whereas that of other companies has not changed much. The greatest difference is observed for the products of company 17, where the average 90 per cent point was 34° C. (61° F.) higher in 1919 than in 1917, and the average boiling point (defined in a previous connection) was 16° C. (29° F.) higher. Other companies whose products show an appreciable lowering in volatility (elevation of the boiling range) during the two-year period are companies 6, 10, and 15.

TABLE 14.—*Comparison of average distillations of samples collected from 14 large marketing companies in 1917 and 1919.*

Com- pany No.	Year.	Initial boiling point.	10 per cent mark.	20 per cent mark.	30 per cent mark.	40 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	Dry point.	Average boiling point.
1	1917	{ 122 50	180 82	207 97	226 108	243 117	266 130	277 136	295 146	318 159	351 177	396 202	408 209	262 128
	1919	{ 120 49	180 82	205 96	225 107	243 117	262 128	282 139	304 151	327 164	361 183	399 204	417 214	266 130
2	1917	{ 120 49	180 82	201 94	217 103	232 111	244 118	261 127	279 137	300 149	333 167	365 185	397 203	252 122
	1919	{ 117 47	163 73	189 87	210 99	228 109	246 119	266 130	289 143	316 158	360 182	403 206	421 216	257 125
3	1917	{ 104 40	176 80	214 101	241 116	262 128	279 137	302 150	320 160	343 173	378 192	406 208	430 221	277 136

TABLE 14.—Comparison of average distillations of samples collected from 14 large marketing companies in 1917 and 1919—Continued.

Company No.	Year.	Initial boiling point.	10 per cent mark.	20 per cent mark.	30 per cent mark.	40 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	Dry point.	Average boiling point.
3	1919	{ 108	163	198	230	257	286	311	338	367	408	439	446	282
		{ 42	73	92	110	125	141	155	170	186	209	226	230	139
4	1917	{ 138	189	207	223	235	250	266	282	306	338	367	397	257
		{ 59	87	97	106	113	121	130	139	152	170	186	203	125
	1919	{ 129	187	208	228	246	266	286	307	331	369	406	428	271
		{ 54	86	98	109	119	130	141	153	166	187	208	220	133
5	1917	{ 124	176	201	217	234	248	262	280	298	324	351	372	248
		{ 51	80	94	103	112	120	128	138	148	162	177	189	120
	1919	{ 133	190	214	232	248	264	280	298	320	354	390	412	268
		{ 56	88	101	111	120	129	138	148	160	179	199	211	131
6	1917	{ 117	180	207	230	244	262	279	298	322	356	390	419	264
		{ 47	82	97	110	118	128	137	148	161	180	199	215	129
	1919	{ 122	176	205	226	248	270	293	318	331	397	412	459	280
		{ 50	80	96	108	120	132	145	159	177	203	228	237	138
8	1917	{ 124	176	198	214	232	246	262	282	307	340	372	396	252
		{ 51	80	92	101	111	119	128	139	153	171	189	202	122
	1919	{ 138	189	210	226	243	259	277	295	316	349	383	412	264
		{ 59	87	99	108	117	126	136	146	158	176	195	211	129
9	1917	{ 126	181	201	216	230	244	259	280	302	340	376	412	253
		{ 52	83	94	102	110	118	126	138	150	171	191	211	123
	1919	{ 138	189	208	226	243	259	279	300	324	363	403	428	268
		{ 59	87	98	108	117	126	137	149	162	184	206	220	131
10	1917	{ 122	178	199	219	234	248	266	286	307	342	374	394	253
		{ 50	81	93	104	112	120	130	141	153	172	190	201	123
	1919	{ 122	176	205	230	250	273	298	322	351	394	426	446	280
		{ 50	80	96	110	121	134	148	162	179	201	219	230	138
12	1917	{ 115	178	205	225	241	257	273	295	318	354	390	419	261
		{ 46	81	96	107	116	125	134	146	159	179	199	215	127
	1919	{ 127	189	217	248	257	273	291	311	334	369	403	426	275
		{ 53	87	103	120	125	134	144	155	168	187	206	219	135
13	1917	{ 133	181	198	208	219	230	239	253	270	297	324	352	232
		{ 56	83	92	98	104	110	115	123	132	147	162	178	111
	1919	{ 131	187	203	217	230	243	255	270	288	318	349	376	246
		{ 55	86	95	103	110	117	124	132	142	159	176	191	119
15	1917	{ 118	180	203	219	234	248	261	280	302	327	358	390	250
		{ 48	82	95	104	112	120	127	138	150	164	181	199	121
	1919	{ 115	172	205	234	257	277	297	316	340	379	399	421	275
		{ 46	78	96	112	125	136	147	158	171	193	204	216	135
17	1917	{ 129	198	223	228	239	252	259	280	289	318	338	363	252
		{ 54	92	106	109	115	122	126	138	143	159	170	184	122
	1919	{ 127	189	217	241	259	279	298	320	343	379	414	432	280
		{ 53	87	103	116	126	137	148	160	173	193	212	222	138
22	1917	{ 111	167	196	226	252	271	291	313	338	374	394	414	268
		{ 44	75	91	108	122	133	144	156	170	190	201	212	131
	1919	{ 104	178	207	228	248	268	286	307	331	369	401	423	268
		{ 40	81	97	109	120	131	141	153	166	187	205	217	131

Gasoline marketed in 1917 and 1919 by companies 1 and 22 was similar throughout the entire distillation range. Company 8 is represented by average figures showing a practically constant relation

through the entire range, the maximum difference being 9°C . (16°F .) at the dry point.

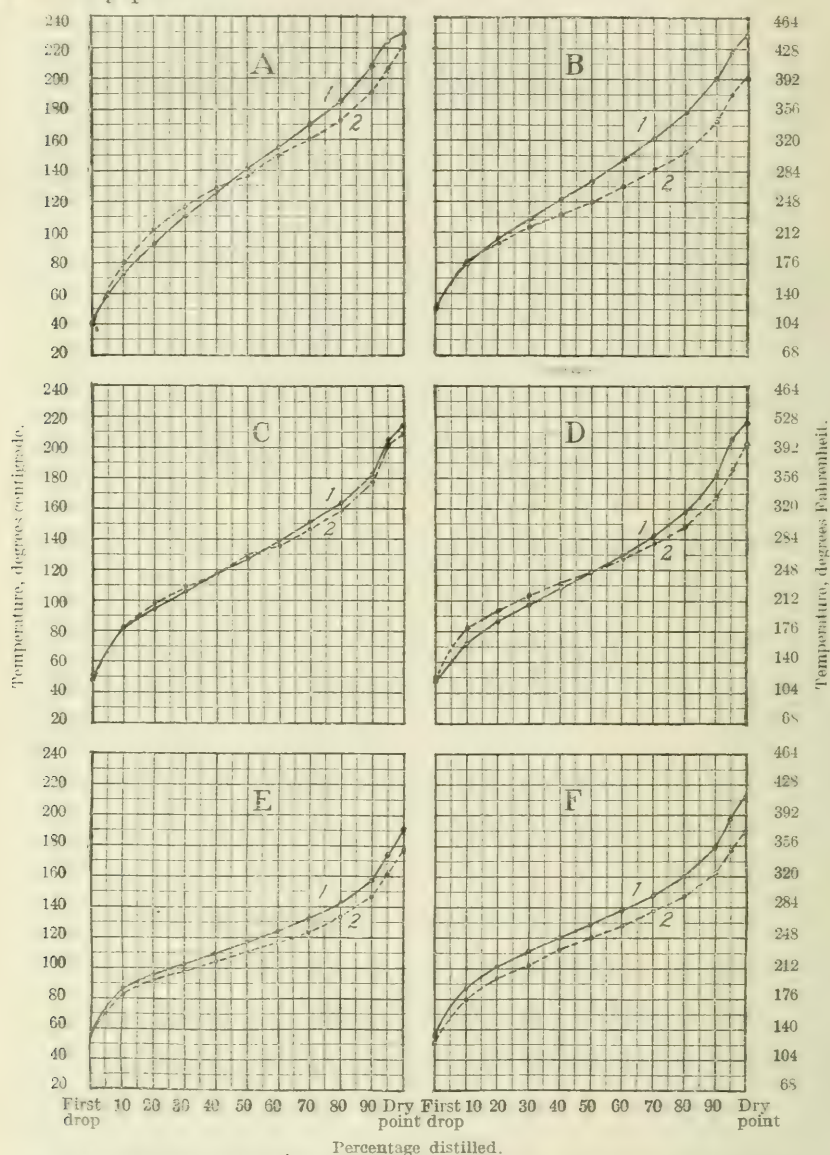


FIGURE 22. Curves showing comparison of average distillation for the series of samples collected in 1917 and 1919 from six representative marketing companies. A, company 3; B, company 10; C, company 1; D, company 2; E, company 13; F, company 5. In each group curve 1 represents the 1919 and curve 2 the 1917 survey.

Figure 22 shows the average 1917 and 1919 distillation curves for six representative companies. Gasoline is marketed by at least one of these companies in every State in the country, and in some States two or three of the companies market. For this reason changes

indicated by the curves are largely indicative of changes that had taken place throughout the entire United States.

The reader will note that, with the exception of gasoline marketed by company 5, there has been little change in the initial boiling-point temperatures. The temperatures for the 20 per cent marks are also practically the same, in some cases being lower in 1919 than in 1917, which is further evidence of the increase in use of casing-head gasoline during the two-year period elapsing between the two surveys. Company 5 apparently is employing casing-head gasoline only to a limited extent. Companies 2 and 3 obviously marketed much larger quantities of casing-head gasoline in 1919 than in 1917, because the temperatures represented by the curves for the later survey are lower, up to the 20 per cent mark, than those for the former survey. This increase in use of volatile material has balanced the increase in the end point to such an extent that the average boiling point for each company is only 3° C. (5° F.) higher in 1919 than in 1917.

The percentage of constituents of low volatility (high boiling point) has increased in all cases. The difference at the 90 per cent mark is only 6° C. (11° F.) for company 1, but is 29° C. (52° F.) for company 10, the differences for the other companies ranging from 12° C. (22° F.) to 17° C. (31° F.).

CONCLUSIONS REGARDING CHANGES IN THE GASOLINE SITUATION BETWEEN 1917 AND 1919.

A comparison of the gasolines marketed in 1917 and 1919 has shown the following general facts of interest:

1. The percentage of samples reported as water white in color and of agreeable odor was lower for the 1919 survey than for the 1917 survey.

2. The percentage of samples "sweet" to the "doctor" test was appreciably lower in the 1919 than in the 1917 survey.

3. The "percentage of unsaturation" of samples obtained from companies selling gasoline containing cracked constituents practically doubled during the two-year period between the surveys. This is indicative of an approximate doubling in the quantity of gasoline produced by cracking processes.

4. As regards volatility, the average grade of gasoline marketed in 1919 contained approximately the same amount of volatile or low boiling constituents as the average grade marketed in 1917, but in 1919 the content of high-boiling (low-volatile) material had notably increased over that maintained in 1917. The average upper boiling limits for the series of samples collected in 1919 were approximately 15° C. (27° F.) higher than the average of samples collected in 1917.

The increase in upper boiling limit or end point does not account for the gain in yield of motor fuel from a given quantity of crude oil, this

gain during the two-year period being estimated at approximately 25 per cent. Experimental data in the possession of the bureau indicate that an increase of 15° C. (27° F.) in end point will account for only 10 to 15 per cent increase in yield of gasoline from the average type of crude petroleum. Therefore, of the 25 per cent increase only 10 to 15 per cent can be credited to this cause. The increased use of cracking processes probably accounts for another 5 per cent, and increased efficiency in distillation equipment, more general use of casing-head gasoline, and proportionately greater production of crude oils of high gasoline content for the remaining 5 to 10 per cent.

GENERAL SUMMARY.

The information contained in this bulletin may be summarized briefly as follows:

1. The production of gasoline in the United States has increased from approximately 7,000,000 barrels for the calendar year 1904 to approximately 85,000,000 barrels for the calendar year 1918. These figures show that the production of gasoline has increased approximately twelve times during the 15-year period. Some of the factors accounting for this are the following:

(a) The quantity of crude oil handled in refineries has increased from 67,000,000 barrels in 1904 to 326,000,000 barrels in 1918, the proportional increase in production for extremes of the 15-year period being represented by the ratio 4.9 to 1.

(b) The yield of gasoline per 42-gallon barrel of crude oil has increased from 4.3 gallons in 1904 to 11 gallons in 1918, the increase being approximately represented by the ratio 2.5 to 1.

(c) The increased yield of gasoline per unit quantity of crude petroleum has been made possible by various changes in refining practice, among which may be noted the production of gasolines of higher end point, the use of more efficient refinery distillation equipment, the use of casing-head gasoline, and the employment of cracking processes. The yield of casing-head gasoline in 1918 has been estimated at approximately 7,500,000 barrels, or nearly 9 per cent of the marketed production of gasoline in that year. The quantity yielded by cracking processes in 1918 has been estimated at about 8,500,000 barrels, or approximately 10 per cent of the total.

2. The consumption of gasoline has kept pace with production. Some of the increases in consumption may be accounted for as follows:

(a) Exports of gasoline and naphtha have increased from 611,250 barrels for the calendar year 1904 to 13,603,221 barrels for the calendar year 1918. Of the gasoline produced in this country in 1904 approximately 8.8 per cent was exported, whereas the proportion exported in 1918 was approximately 16 per cent.

(b) The number of automobiles and trucks in use in the country has increased from 325,000 in 1909 to approximately 6,000,000 in 1918. The relative increase for the period 1904 to 1918 is, of course, much greater than for the period 1909 to 1918, inclusive.

(c) Other uses of gasoline and naphtha, as in the rubber industry, the dry-cleaning industry, etc., have undoubtedly increased though probably in considerably less proportion than the increases in exports and in consumption by motor vehicles.

3. The conservation of gasoline is essential, as demands for this commodity are increasing much more rapidly than the supply of raw material (crude petroleum) from which it is derived. The following are two important factors which are contributing in permitting conservation:

(a) Improvements in construction of internal-combustion engines have increased the efficiency in utilizing fuel and have permitted the use of less volatile types of fuel. Among improvements which are already accomplished may be listed the use of self-starters, short manifolds, hot-spot manifolds, and devices for heating intake air. Further improvements along these and other lines are anticipated, as the automotive industry is aware of the fuel problem and is devoting much energy to its solution.

(b) The production of motor fuels from sources other than crude petroleum is a conservation measure which is receiving attention. Undoubtedly satisfactory motor fuel can be produced from other sources, as such fuels are already in the market. However, the substitute fuels at present marketed represent only an insignificant proportion of the total gasoline consumed.

4. It has been shown that the wholesale price of gasoline in one locality (New York City) for which figures are available over a period of years has practically paralleled the average price of crude oil. This relation does not hold without exception, but is sufficiently definite to indicate that refiners have not been profiteering. One of the noteworthy exceptions is for the period since 1916, during which time the price of crude oil had advanced, while the New York price of gasoline has remained practically constant. The constancy in price has not been maintained in other districts of the country and the price of gasoline would probably be found to parallel that of crude oil since 1916 if an average figure for the whole country were used instead of that quoted in New York City.

5. Sometimes the price of gasoline in adjoining States differs decidedly, owing to the varying marketing practices of companies which practically control the price of gasoline. In general, however, variations in the price of gasoline are explainable on the basis of transportation costs and differences in the grade of gasoline marketed in various sections of the country.

6. State and municipal legislative requirements regarding the quality of gasoline have been discussed. Many of these are unscientific and unreasonable, and if they were rigidly enforced a marked decrease in production of motor fuel would result. Oftentimes legislative requirements are a disadvantage rather than an advantage to the general public, and, in case they are deemed necessary, care should be taken that attempts to protect the consumer do not restrict the production of motor fuel.

7. The gasoline survey of 1919, which involved the collection and analysis of 851 samples from all parts of the country, supplied the following information:

(a) The variations in retail price throughout the country are in general consistent with differences in transportation costs and in quality of the motor fuel marketed. The average retail price maintained in the Middle West and on the Pacific coast is between 20.5 cents and 25 cents per gallon. In the Middle Atlantic and Southeastern States the average retail price is generally between 25 and 27 cents per gallon. In New England and in the Rocky Mountain States the corresponding figure is generally between the limits of 27 to 30 cents per gallon.

(b) The gravities of products sold as motor fuel varied over a wide range, extreme limits being 30.6° B. (specific gravity, 0.872) and 74.3° B. (specific gravity, 0.685). The range in gravity is due partly to difference in volatility, but chiefly to differences in chemical composition of the motor fuels. Products having gravities below 50° B. generally contained appreciable percentages of benzol or other coal-tar distillates. The following differences characteristic of gasoline produced from different types of crude may be noted:

The average gravities of motor gasolines made from California crude range between 52° and 56° B. (specific gravity, 0.769 to 0.753). The gravity range for gasoline produced from Mid-Continent crude was 55° to 58° B. (specific gravity, 0.757 to 0.745) and for Pennsylvania crude 59° to 63° B. (specific gravity, 0.741 to 0.725). The gravities of gasolines of the same volatility produced from the three different types of crudes were shown to differ 2° to 10° B. The principal utility of gravity measurement was shown to be the possibility of ascertaining the nature of the crude from which the gasoline was derived, or the detection of benzol and other coal-tar constituents.

(c) Distillation analyses showed characteristic differences in the volatility range of gasoline marketed in different sections of the country. The following sections may be listed in order of increasing volatility (decreasing average boiling point): Rocky Mountain district, Middle Western States, Atlantic seaboard, and Pacific coast. Certain States are noteworthy exceptions in the various districts

where they are situated, but the general rule is approximately as stated.

The distillation tests showed that a large proportion of the gasoline marketed is of the blended type and that straight refinery products are in the minority. Most of the blends contained casing-head gasoline; a limited number contain benzol and other coal-tar products.

(d) A relatively high percentage of the samples collected in the 1919 survey were reported as of yellowish color and "poor" odor. These two properties are, however, difficult to determine reliably, and in any event are largely without practical significance in indicating the commercial utility of motor fuel.

(e) Of the several tests used for detecting the acidity of samples, that involving employment of methyl orange indicator proved most satisfactory. The majority of samples collected in the survey passed the acidity test. Some States, however, had a relatively high proportion of samples in which the presence of acid was detected.

(f) The various refining companies showed considerable difference as regards the percentage of their samples reported as "sweet" to the "doctor" test, some companies having all their samples passing the test, others showing as low as 12 per cent passing. No evidence is at hand showing the necessity of refining gasoline so that it will pass the "doctor" test, and the results are reported simply as indicative of variations in practice of different companies.

(g) "Percentages of unsaturation" of samples in the 1919 survey varied between extremes of less than 1 per cent up to 22 per cent. Samples less than 1 per cent saturated were "straight-run" products or casing-head blends. The sample reported as 22 per cent unsaturated was an unblended cracked distillate. A considerable number of samples were found to be 10 to 12 per cent unsaturated, which indicated that they contained 40 to 50 per cent of constituents produced by cracking processes.

(h) The copper-dish evaporation test (developed for use in testing airplane gasoline) was not found satisfactory for use with motor gasoline. The majority of the samples collected in the 1919 survey failed to pass this test, and it was discovered that the test was not a reliable indicator of the quantity of gum formed. About 69 per cent of the samples collected in the 1919 survey showed residues of less than 30 mg., but even this limit is not recommended by the bureau for use in specifications for motor gasoline.

(i) Distillation tests showed that as a general rule different companies have different standards regarding boiling range which are maintained regardless of the section of the country in which their gasolines are marketed. The differences in boiling range characteris-

tic of refining practice of various companies are more noticeable than the differences characteristic of various sections of the country.

(j) A relatively small proportion (26.9 per cent) of the samples collected in the 1919 survey would satisfy the Government specification adopted in October, 1918, for motor gasoline. The revised specification adopted in October, 1919, could be satisfied by approximately one-half the samples collected in the 1919 survey. It was estimated that if all gasoline were produced in accordance with the standard of quality set by the revised specification there would be no decrease in the Nation's production of motor fuel.

9. The 1917 gasoline survey, for which 247 samples were collected, supplied the following information:

(a) The range in price of motor gasoline was similar to that observed in the 1919 survey, the general level being somewhat lower. The advances in price for the period 1917 to 1919 were generally between one-half and 2 cents per gallon.

(b) No gasolines containing benzol or other coal-tar distillates were collected in the 1917 survey, therefore the gravities of the samples do not vary over as wide a range as those of 1919. The same general difference among gravities characteristic of products derived from different types of crudes was observed as for the results of the 1919 survey. The gravity ranges characteristic of products from the different producing fields are approximately as follows: Gasoline from the California field, 56.4 to 59.4° B. (specific gravity, 0.751 to 0.739); Mid-Continent field, 56.9 to 61.3° B. (specific gravity, 0.749 to 0.732); Pennsylvania field, 60.5 to 64.4° B. (specific gravity, 0.735 to 0.720).

(c) Distillation analyses showed that the volatilities characteristic of motor fuel marketed in different sections of the country varied in the same order as that noted for the 1919 survey except as regards the Rocky Mountain States. In 1917 some of the gasoline marketed in these States was shipped in from California and the Mid-Continent field, the rest was produced from Rocky Mountain crudes. The California gasolines had the same low boiling range (high volatility) as the products marketed on the Pacific coast. The samples of gasoline produced from Mid-Continent and Rocky Mountain crude were of relatively low volatility (high boiling range). In the 1919 survey practically all the gasoline marketed in the Rocky Mountain district was produced from Rocky Mountain crude. The grade of gasoline was more uniformly of high boiling range than in 1917. Certain exceptions to the general rules regarding volatility characteristic of the different districts of the country were observed for the 1917 survey, but these exceptions were not always similar to those observed in the 1919 survey.

(d) The general range of unsaturation of samples collected in 1917 was between less than 1 per cent and 6 per cent. This indicates that the maximum content of cracked distillates in the gasoline marketed during that year was only about half that of gasoline sold by the same companies in 1919.

(e) The proportion of samples collected in 1917 that were "sweet" to the "doctor" test was greater than the proportion of the samples "sweet" to this test in 1919.

(f) Results of the 1917 survey showed volatility differences characteristic of various companies in much the same way as the 1919 survey. The 1917 survey showed, however, a greater tendency on the part of small refiners to produce gasolines of relatively high volatility (low boiling range). By 1919 a number of these companies had abandoned their former practice and were adopting standards of volatility equivalent to those of the larger companies.

10. The important differences between results of the 1917 and 1919 surveys may be summarized briefly as follows:

(a) The gravity of gasoline was in general lowered 2 to 3 degrees Baumé during the two-year period.

(b) The results obtained by measuring percentages of unsaturation indicated that the output of cracked distillates had practically doubled in the course of the two-year period.

(c) As regards volatility, it was shown that gasoline marketed in 1919 contained about the same content of low boiling (high volatile) constituents as the average grade marketed in 1917, but that the upper boiling limits, particularly the 90 per cent mark and dry point, were appreciably higher in 1919 than in 1917, the average difference being about 15° C. (27° F.).

TABLE 15.—Marketing data and analytical figures for gasolines

ALABAMA.

Sample No.	City.	Company No.	Sample collected from	Price, cents per gallon.		Gravity at 15° C.		Distillation.*				
				Retail.	Tank wagon.	Specific gravity.	Degrees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
256	Birmingham.....	2	D.....	26½	24½	0.735	60.5	{ 113 45	142 61	162 72	192 89	212 100
257	do.....	6	D.....	(3)	24½	.753	55.9	{ 172 78	203 95	228 109	239 115	255 124
258	do.....	12	S.....	26½	24½	.743	58.4	{ 129 54	160 71	181 83	207 97	228 109
259	do.....	12	F.....	26½	.....	.747	57.4	{ 129 54	172 78	189 87	216 102	235 113
260	do.....	1	D.....	26½	24½	.746	57.7	{ 118 48	185 55	203 95	221 105	237 114
261	do.....	248	F.....	26½	24½	.767	52.5	{ 154 68	194 90	203 95	223 106	239 115
262	Mobile.....	2	F.....	25	23	.738	59.7	{ 113 45	133 56	156 69	169 76	203 95
263	do.....	57	F.....	25	23	.741	58.9	{ 136 58	174 79	205 96	230 110	248 120
264	do.....	65	F.....	25	.....	.750	56.7	{ 118 48	158 70	181 83	212 100	239 115
265	do.....	12	F.....	25	23	.748	57.2	{ 129 54	180 82	201 94	228 109	246 119
266	do.....	1	D.....	25	23	.746	57.7	{ 122 50	167 75	189 87	214 101	234 112
267	Montgomery.....	2	F.....	26½	24½	.738	59.7	{ 111 44	140 60	158 70	183 84	207 97
268	do.....	12	F.....	26½	.....	.749	56.9	{ 124 51	164 75	167 90	228 109	248 120
269	do.....	1	F.....	26½	24½	.742	58.7	{ 108 42	174 79	198 92	219 104	234 112
270	do.....	249	F.....	26½	24½	.781	49.3	{ 154 68	176 80	185 85	199 93	212 100

ARIZONA.

271	Tucson.....	13	G.....	26	24	0.762	53.7	{ 140 60	172 78	189 87	203 95	216 102
272	do.....	1	G.....	23	24	.755	55.4	{ 118 48	160 71	181 83	208 98	230 110
273	do.....	1	F.....	26	24	.756	55.2	{ 117 47	167 75	187 86	216 102	235 113
274	do.....	1	S.....	24	24	.755	55.4	{ 126 52	147 74	183 84	212 100	234 112
275	do.....	14	D.....	.....	24	.765	53.0	{ 135 57	167 75	181 83	201 94	217 103
276	do.....	14	F.....	26	24	.766	52.8	{ 118 48	165 74	181 83	203 95	219 104

* In this column, D means "distributing station;" F, "filling station;" G, "garage;" P, "gasoline plant;" R, "refinery;" S, "service stations;" T, "tank wagon;" W, "warehouse;" X, "retail store."

* For each sample, the upper line shows results in degrees Fahrenheit and the lower line in degrees centigrade.

collected in the 1919 survey, arranged by States.

ALABAMA.

Distillation ² —Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
230 110	239 115	248 120	268 131	289 143	322 161	365 185	415 213	432 222	433 223	257 125	2.4	256
268 131	277 136	284 140	300 149	315 157	338 170	369 187	412 211	430 221	435 224	291 141		
248 120	257 125	266 130	288 142	302 150	334 168	372 189	408 209	417 214	428 220	271 133	1.6	258
257 125	264 129	275 135	293 145	318 159	347 175	387 197	424 218	437 225	448 231	280 138		
250 121	253 123	259 126	277 136	293 145	313 156	345 174	388 198	403 206	405 207	266 130	2.0	260
253 123	262 128	271 133	289 143	307 153	334 168	372 189	412 211	423 217	432 222	280 138		
219 104	232 111	244 118	264 129	289 143	327 164	367 186	428 220	..... .....	430 221	253 123	3.5	262
264 129	273 134	282 139	297 147	311 155	322 161	361 183	388 198	401 205	415 213	279 137		
259 126	270 132	280 138	298 148	320 160	347 175	387 197	414 212	437 225	439 226	280 138	1.8	264
264 129	270 132	275 135	295 146	313 156	334 168	365 185	392 200	410 210	419 215	279 137		
248 120	257 125	266 130	286 141	306 152	331 166	356 180	392 200	406 208	419 215	270 132	1.8	266
225 107	234 112	243 117	262 128	284 140	311 155	356 180	408 209	423 217	424 218	252 122		
264 129	257 125	284 140	300 149	316 158	325 163	365 185	399 204	412 211*	421 216	279 137	2.0	268
246 118	255 124	262 128	275 135	291 144	311 155	342 172	388 198	..... .....	399 204	262 128		
230 110	243 117	253 123	277 136	297 147	325 163	358 181	392 200	406 208	414 212	264 129	1.0	270

ARIZONA.

230 110	234 112	241 116	252 122	266 130	284 140	309 154	334 168	345 174	352 178	244 118	1.3	271
246 119	255 124	264 129	286 141	304 151	327 164	361 183	408 209	426 219	426 219	268 131		
252 122	262 128	270 132	288 142	309 154	329 165	370 188	435 224	..... .....	442 228	273 134	2.7	273
252 122	257 125	264 129	282 139	304 151	327 164	360 182	406 208	426 219	428 220	270 132		
230 110	237 114	244 118	257 125	275 135	297 147	325 163	367 186	376 191	410 210	252 122	1.5	275
232 111	239 115	244 118	261 127	277 136	336 169	388 198	465 207	408 209	412 211	261 127		

² No retail station price obtained.

TABLE 15.—Marketing data and analytical figures for gasolines

ARKANSAS.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
277	Hot Springs.....	15	F.....	26	24	0.748	57.2	{ 106 41	140 60	167 75	225 107	264 129
278	do.....	9	F.....	26	24	.745	57.9	{ 153 67	185 85	198 92	212 100	228 109
279	do.....	9	F.....	26	24	.746	57.7	{ 145 63	176 80	189 87	208 98	226 108
280	do.....	9	F.....	26	24	.745	57.9	{ 135 57	172 78	189 87	210 99	228 109
281	Little Rock.....	140	F.....	26	24	.743	58.4	{ 113 45	154 68	172 78	198 92	217 103
282	do.....	15	F.....	26	24	.738	59.7	{ 97 36	129 54	153 67	194 90	243 117
283	do.....	15	F.....	26	24	.736	60.2	{ 95 35	127 53	145 63	185 85	232 111
284	do.....	8	F.....	28½	26½	.749	56.9	{ 153 67	183 84	199 93	217 103	230 110
285	do.....	8	F.....	28½	26½	.750	56.7	{ 145 63	180 82	192 89	212 100	228 109
286	do.....	9	F.....	26	24	.746	57.7	{ 135 57	163 73	181 83	201 94	216 102
287	do.....	213	F.....	26	24	.747	57.4	{ 113 45	151 66	172 78	205 96	228 109
288	do.....	17	F.....	26	24	.750	56.7	{ 135 57	181 83	194 90	217 103	235 113

CALIFORNIA.

289	Berkeley.....	19	G.....	20½	.....	0.748	57.2	{ 113 45	153 67	158 70	190 88	205 96
290	do.....	16	D.....	20½	.....	.763	53.5	{ 133 56	176 80	196 91	221 105	239 115
291	do.....	16	D.....	13½	.....	.796	45.9	{ 219 104	259 126	268 131	279 137	286 141
292	do.....	13	D.....	20½	.....	.754	55.7	{ 135 57	176 80	192 89	208 98	219 104
293	Los Angeles.....	13	F.....	20½	.....	.753	55.9	{ 117 47	171 77	187 86	205 96	221 105
294	do.....	92	F.....	20½	.....	.771	51.6	{ 127 53	185 85	199 93	219 104	237 114
295	do.....	84	F.....	20½	.....	.746	57.7	{ 131 55	162 72	176 80	192 89	210 99
296	do.....	256	F.....	20½	.....	.760	54.2	{ 124 51	174 79	187 86	205 96	221 105
297	do.....	14	F.....	20½	.....	.757	54.9	{ 120 49	165 74	183 83	203 95	219 104
298	do.....	72	F.....	20½	.....	.760	54.2	{ 124 51	171 77	185 85	205 96	217 103
299	Sacramento.....	19	G.....	21	19	.766	52.9	{ 131 55	169 76	181 83	201 94	219 104

collected in the 1919 survey, arranged by States—Continued.

ARKANSAS.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
289 143	293 145	306 152	324 162	340 171	360 182	394 201	433 223	.....	437 225	291 144	2.5	277
228 109	250 121	259 126	275 135	293 145	315 157	351 177	388 198	401 205	414 212	266 130	1.6	278
243 117	252 122	255 124	282 139	300 149	327 164	372 189	415 213	428 220	437 225	271 133	1.0	279
246 119	259 125	266 130	284 140	309 154	334 168	379 193	428 220	446 230	453 234	275 135	1.6	280
235 113	248 120	257 125	277 136	295 146	324 162	363 184	399 204	412 211	424 218	261 127	1.0	281
280 138	298 148	311 155	331 166	351 177	374 190	414 212	.....	.....	437 225	289 143	5.9	282
275 135	284 140	298 148	322 161	345 174	370 188	414 212	.....	.....	424 218	282 139	6.8	283
244 118	252 122	259 126	271 133	291 144	315 157	345 174	381 194	342 200	421 216	268 131	.8	284
243 117	230 110	259 126	275 135	293 145	311 155	343 173	381 194	396 202	410 210	264 129	.8	285
232 111	243 117	248 120	275 135	295 146	318 159	354 179	392 200	403 206	417 214	261 127	1.0	286
248 120	259 126	270 132	291 144	316 153	343 173	383 195	430 221	439 226	455 235	275 135	1.1	287
252 122	261 127	262 128	288 142	307 153	331 166	361 183	390 199	392 200	415 213	273 134	.8	288

CALIFORNIA.

216 102	221 105	230 110	244 118	262 128	279 137	315 157	356 180	378 192	392 200	237 114	1.8	289
252 122	257 125	261 127	275 135	291 144	334 168	340 171	374 190	388 198	392 200	266 130	2.8	290
298 148	302 150	307 153	318 159	329 165	347 175	374 190	405 207	414 212	433 223	315 157	.4	291
230 110	235 113	241 116	250 121	266 130	284 140	309 154	343 173	356 180	367 186	246 119	1.3	292
234 112	239 115	244 118	259 126	275 135	293 145	322 161	352 178	367 186	376 191	248 120	1.5	293
250 121	257 125	264 129	279 137	289 143	311 155	340 171	374 190	388 198	403 206	266 130	.8	294
225 107	232 111	239 115	252 122	273 134	293 145	325 163	361 183	381 194	394 201	246 119	1.4	295
237 114	244 118	244 118	266 130	280 138	307 153	340 171	374 190	388 198	405 207	255 124	1.1	296
234 112	241 116	248 120	264 129	277 136	298 148	327 164	360 182	374 190	396 202	252 122	.8	297
232 111	237 114	243 117	262 128	277 136	297 147	327 164	361 183	372 189	390 199	250 121	1.2	298
231 112	239 115	246 119	257 125	273 134	298 148	329 165	367 186	378 192	390 199	252 122	1.4	299

TABLE 15.—*Marketing data and analytical figures for gasolines*

CALIFORNIA—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	Degrees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
300	Sacramento.....	19	G.....	15	13	0.805	43.9	{ 212 100	257 125	264 129	277 136	286 141
301	do.....	19	S.....	21	19	.761	54.1	{ 131 55	163 73	172 78	194 90	208 98
302	do.....	16	S.....	21	19	.763	53.6	{ 111 44	167 75	185 85	210 99	225 107
303	do.....	16	S.....	21	19	.770	51.8	{ 124 51	165 74	187 86	212 100	230 110
304	do.....	13	S.....	21	19	.764	53.2	{ 135 57	181 83	190 88	205 96	216 102
305	do.....	13	S.....	21	19	.765	53.0	{ 149 65	174 79	185 85	201 94	212 100
306	do.....	14	G.....	20	19	.762	53.7	{ 136 58	163 73	180 82	201 94	217 103
307	do.....	14	S.....	21	19	.759	54.7	{ 120 49	154 68	172 78	194 90	212 100
308	San Diego.....	12	G.....	21	.....	.756	55.2	{ 129 54	163 73	181 83	201 94	216 102
309	do.....	14	G.....	21	.....	.750	56.7	{ 113 45	151 66	167 75	192 89	210 99
310	San Francisco.....	19	F.....	13½	.....	.790	47.2	{ 194 90	243 117	253 123	268 131	280 138
311	do.....	16	D.....	20½	.....	.763	53.5	{ 131 55	176 80	196 91	223 106	241 116
312	do.....	13	D.....	20½	.....	.755	55.4	{ 144 62	178 81	192 89	207 97	212 100
313	do.....	14	G.....	20½	.....	.750	56.7	{ 118 48	149 64	169 75	194 90	212 100
314	do.....	14	D.....	20½	.....	.752	56.2	{ 118 48	160 71	178 81	203 95	221 105
315	do.....	14	F.....	68	.....	.710	67.2	{ 86 30	95 35	100 38	113 45	126 52
316	do.....	14	F.....	68	48	.710	67.2	{ 88 31	97 36	102 39	113 45	126 52

COLORADO.

317	Colorado Springs..	10	G.....	28	26	0.762	53.7	{ 118 48	153 67	176 80	208 98	239 115
318	do.....	4	F.....	28	26	.756	55.2	{ 142 61	192 89	201 94	217 103	237 114
319	do.....	1	G.....	28	26	.762	53.7	{ 111 44	162 72	180 82	208 98	239 115
320	Denver.....	94	F.....	28	26	.754	55.7	{ 142 61	176 80	189 87	212 100	234 112
321	do.....	25	F.....	28	.....	.751	56.4	{ 136 58	181 83	196 91	219 104	239 115
322	do.....	10	F.....	28	.....	.757	55.0	{ 118 48	160 71	183 84	208 98	234 112

collected in the 1919 survey, arranged by States—Continued.

CALIFORNIA—Continued.

Distillation--Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
298 148	304 151	307 153	320 160	333 167	354 179	388 198	417 214	430 221	439 226	316 158	1.3	300
219 104	286 108	234 112	243 117	259 126	280 138	313 156	347 175	361 183	388 198	211 116	.6	301
241 116	246 119	252 122	270 132	286 141	304 151	315 157	361 183	370 188	379 193	252 122	1.0	302
244 118	252 122	261 127	273 134	288 142	306 152	334 168	360 182	369 187	388 198	259 126	1.1	303
226 108	234 112	246 119	255 124	262 128	277 136	302 150	329 165	334 168	363 184	243 117	.8	304
223 106	228 109	234 112	244 118	257 125	275 135	300 149	329 165	338 170	360 182	241 116	.9	305
234 112	239 115	246 119	255 124	280 138	311 155	334 168	374 190	388 198	394 201	253 123	.8	306
225 107	232 111	237 114	255 124	270 132	295 146	338 170	369 187	381 194	396 202	246 119	1.6	307
230 110	237 114	244 118	257 125	270 132	286 141	315 157	354 179	365 185	374 190	244 118	2.1	308
225 107	228 109	237 114	257 125	275 135	298 148	331 166	374 190	388 198	399 204	262 128	2.2	309
243 145	298 148	302 150	316 158	329 165	347 175	381 194	419 215	433 223	444 229	309 154	1.1	310
252 122	257 125	262 128	273 134	289 143	307 153	334 168	361 183	378 192	385 196	262 128	1.8	311
230 110	235 113	243 117	262 128	271 133	279 137	309 154	329 165	340 171	345 174	244 118	1.8	312
230 110	237 114	241 116	252 122	277 136	298 148	334 168	374 190	387 197	392 200	246 119	2.5	313
234 112	241 116	248 120	262 128	279 137	302 150	340 171	383 195	394 201	401 205	253 123	1.6	314
140 60	147 64	154 68	172 78	189 87	210 99	284 140	.....	.....	284 140	169 76	9.0	315
138 59	145 63	154 68	171 77	189 87	208 98	286 141	.....	.....	286 141	169 76	9.0	316

COLORADO.

266 130	279 137	288 142	320 160	345 174	370 188	408 209	446 230	.....	457 236	291 144	3.3	317
255 124	264 129	273 134	293 145	306 152	340 171	374 190	408 209	417 214	424 218	279 137	1.6	318
252 122	277 136	288 142	315 157	342 172	370 188	428 220	448 231	450 232	450 232	289 143	2.3	319
253 123	262 128	273 134	291 144	316 158	342 172	381 194	421 216	430 221	432 222	279 137	1.8	320
255 124	264 129	275 135	293 145	315 157	342 172	381 194	419 215	430 221	444 229	282 139	.9	321
255 124	264 129	275 135	307 153	333 167	358 180	399 204	439 226	453 234	459 237	284 140	1.8	322

TABLE 15.—Marketing data and analytical figures for gasolines

COLORADO—Continued.

Sample No.	City.	Company No.	Sample collected from	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
323	Denver	10	F	36	.....	0.726	63.0	{ 108 42	140 60	151 66	167 75	183 84
324	do.....	122	F	28	.....	.756	55.2	{ 171 77	196 91	205 96	221 105	235 113
325	do.....	141	F	28	26	.758	54.8	{ 144 62	192 89	208 98	228 109	244 118
326	do.....	141	F	45	.....	.695	71.4	{ 95 35	106 41	113 45	126 52	138 59
327	do.....	4	F	28	.....	.751	56.4	{ 126 52	172 78	190 88	214 101	234 112
328	do.....	1	F	28	.....	.756	55.2	{ 109 43	154 68	174 79	210 99	243 117
329	Fort Collins.....	10	F	27	26	.760	54.2	{ 111 44	156 69	180 82	219 104	248 120
330	do.....	10	G	27	.....	.759	54.5	{ 133 56	162 72	171 77	203 95	228 109
331	do.....	10	F	27	.....	.759	54.5	{ 111 44	149 65	174 79	212 100	243 117
332	do.....	122	G, F..	27	26½	.743	58.4	{ 111 44	149 65	163 73	185 85	207 97
333	do.....	4	G, F..	27	26	.749	56.9	{ 118 48	162 72	174 79	205 96	228 109
334	do.....	1	F	27	26	.762	53.7	{ 120 49	160 71	181 83	217 103	244 118
335	Pueblo.....	10	G	28	26	.760	54.2	{ 136 58	178 81	192 89	214 101	234 112
336	do.....	10	F	28	.....	.760	54.2	{ 131 55	174 79	194 90	214 101	234 112
337	do.....	59	F	28	.....	.755	55.4	{ 151 66	192 89	210 99	230 115	259 126
338	do.....	59	F	28	26	.745	57.9	{ 133 56	180 82	196 84	221 105	241 116
339	do.....	4	F	26½	.....	.747	57.6	{ 127 53	180 82	196 91	210 99	225 107
340	do.....	1	D	28	26	.756	55.2	{ 108 41	138 59	160 71	192 89	225 107

CONNECTICUT.

341	Bridgeport.....	2	G .....	.....	24½	0.739	59.4	{ 113 45	147 64	165 74	198 92	221 105
342	do.....	2	S .....	.....	25	.750	56.7	{ 133 56	172 78	190 88	217 103	239 115
343	do.....	5	S .....	.....	25	.744	58.2	{ 129 54	162 72	172 78	212 100	232 111
344	do.....	1	G .....	.....	28	.751	56.4	{ 115 46	154 68	178 81	212 100	235 113
345	Hartford.....	2	F .....	.....	27	.739	59.4	{ 118 48	149 65	165 74	196 91	221 105

collected in the 1919 survey, arranged by States—Continued.

COLORADO—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
194 90	203 95	210 99	223 106	244 118	271 133	315 157	358 181	376 191	381 194	223 106	2.0	323
248 120	259 126	270 132	284 140	304 151	329 166	369 187	410 210	426 219	435 224	279 137		
261 127	270 132	277 136	291 144	311 155	329 165	358 181	383 195	394 201	417 214	279 137	1.8	325
153 67	162 72	169 76	187 86	207 97	234 112	280 138	381 194	-----	381 194	189 87		
250 121	261 127	271 133	291 144	311 155	329 165	370 188	392 200	406 208	419 215	273 134	1.5	327
262 128	279 137	293 145	316 158	345 171	374 190	417 214	455 235	468 242	473 245	293 145		
273 134	288 142	302 150	327 164	356 180	388 198	426 219	-----	-----	446 230	298 145	4.2	329
248 120	259 126	271 138	300 149	331 166	369 187	410 210	446 230	462 239	475 246	286 141		
266 130	279 137	291 144	316 158	342 172	372 189	419 215	-----	-----	439 226	289 143	3.2	331
228 109	237 114	246 119	270 132	309 154	349 176	397 203	428 220	442 228	451 233	266 130		
243 117	253 123	280 138	286 141	298 148	320 150	354 179	381 194	394 201	405 207	264 129	1.5	333
266 132	277 136	288 142	313 156	338 170	313 187	369 216	421 233	451 242	468 247	295 146		
255 124	270 132	279 137	297 147	320 160	345 174	378 192	406 208	415 213	430 321	280 138	.6	335
253 123	266 130	275 135	297 147	320 160	345 174	379 193	405 207	415 213	424 218	279 137		
279 137	286 141	295 146	313 156	331 166	351 177	379 193	410 210	419 215	433 223	295 146	1.6	337
262 128	266 139	270 132	288 142	306 152	324 162	356 180	387 197	394 201	406 208	273 134		
241 116	250 121	257 125	280 138	300 149	325 163	363 184	397 203	406 208	424 218	268 131	.7	339
257 125	275 135	288 142	311 155	342 172	369 187	399 204	442 228	451 233	451 233	282 139		

CONNECTICUT.

239 115	248 120	261 127	280 138	302 150	327 164	369 187	415 213	428 220	428 220	264 129	2.5	341
257 125	265 130	275 135	291 144	306 152	336 169	374 190	415 213	430 221	437 225	279 137		
250 121	257 125	257 125	288 142	306 152	325 163	360 182	392 200	403 206	408 209	268 131	2.2	343
255 124	272 128	275 135	289 143	304 151	333 167	367 186	410 210	-----	419 215	271 133		
239 115	248 120	257 125	277 136	298 148	325 163	363 184	414 212	428 220	428 220	262 128	2.2	345

TABLE 15.—Marketing data and analytical figures for gasolines
CONNECTICUT—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
346	Hartford.....	6	G.....	28	24½	0.750	56.7	{ 126 52	158 70	176 80	207 97	230 110
347	do.....	219	F.....	26	.....	.744	58.2	{ 162 72	216 102	225 107	244 118	257 125
348	do.....	219	S.....	27	24½	.741	58.9	{ 178 81	212 100	223 106	239 115	252 122
349	do.....	5	F.....	27	24½	.742	58.7	{ 126 52	165 74	185 85	212 100	232 111
350	do.....	1	F.....	27	24½	.749	56.9	{ 100 38	136 58	154 66	181 83	203 95
351	New Haven.....	18	D.....	32	28	.728	62.3	{ 167 75	183 84	189 87	194 90	201 94
352	do.....	18	D.....	25	24½	.752	56.2	{ 131 55	167 75	185 85	221 105	246 119
353	do.....	37	G.....	24	.....	.740	59.2	{ 153 67	196 91	208 98	226 108	239 115
354	do.....	138	F.....	25	24½	.740	59.2	{ 120 49	158 70	183 84	219 104	243 117
355	do.....	2	F.....	25	24½	.739	59.4	{ 118 48	149 65	165 74	196 91	221 105
356	do.....	5	G.....	26	24½	.743	58.4	{ 131 55	167 75	183 84	212 100	230 110
357	do.....	1	F.....	26½	24½	.755	55.4	{ 115 46	133 56	149 65	174 79	196 91
358	do.....	21	D.....	25	24½	.738	59.7	{ 122 50	158 70	178 81	208 98	230 110

DELAWARE.

359	Wilmington.....	18	G.....	27	24.3	0.745	57.9	{ 117 47	145 63	163 73	194 90	219 104
360	do.....	145	S.....	27	24.3	.753	55.9	{ 104 40	147 64	165 74	189 87	210 99
361	do.....	11	G.....	27	24.3	.735	60.5	{ 147 64	178 81	192 89	208 98	223 106
362	do.....	20	S.....	27	24.3	.739	59.4	{ 158 70	192 89	205 96	223 106	237 114
363	do.....	1	S.....	27	24.3	.756	55.2	{ 117 47	149 65	165 74	192 89	212 100

DISTRICT OF COLUMBIA.

1937	Washington.....	116	D.....	.....	30	0.710	67.2	{ 86 30	104 40	115 46	140 60	172 78
1938	do.....	116	D.....	.....	22.5	.745	57.9	{ 129 54	176 80	193 92	223 106	248 120
1939	do.....	199	D.....	25	22.5	.742	5.87	{ 95 35	118 48	135 57	167 75	207 97
1949	do.....	7	D.....	25	22.5	.739	59.4	{ 135 57	176 80	194 90	216 102	239 115
1941	do.....	1	D.....	25	22.5	.750	56.7	{ 115 46	153 67	172 78	205 96	226 108

collected in the 1919 survey, arranged by States—Continued.

CONNECTICUT—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
252 122	202 128	273 134	293 145	320 160	354 179	401 205	457 236	466 241	468 242	282 139	1.8	346
270 132	277 136	280 138	293 145	311 155	329 165	358 181	383 195	397 203	415 213	286 141		
244 129	268 131	277 136	293 145	307 153	324 162	352 178	387 197	397 203	401 205	282 139	1.3	348
248 120	257 125	264 129	280 138	298 148	318 159	352 178	397 203	410 210	414 212	266 130		
226 108	239 115	248 120	277 136	304 151	331 166	370 188	.....	.....	414 212	255 124	3.7	350
298 98	212 100	214 102	221 105	230 110	241 116	262 128	289 143	302 150	327 164	223 106		
264 129	273 134	282 139	302 150	320 160	345 174	383 195	428 220	444 229	451 233	284 140	2.0	352
250 121	257 125	257 125	271 133	286 141	300 149	329 165	361 183	378 192	381 194	264 129		
262 128	273 134	282 139	298 148	318 159	343 173	379 193	428 220	.....	444 229	280 138	3.0	354
239 115	248 120	257 125	277 136	298 148	325 163	363 184	414 212	428 220	428 220	262 128		
243 117	250 121	261 127	284 140	300 149	322 161	352 179	388 198	401 205	408 209	266 130	2.0	356
216 102	228 109	241 116	270 132	295 146	327 164	367 186	414 212	.....	421 216	252 122		
246 119	253 123	266 130	280 138	304 151	327 164	360 182	401 205	414 212	414 212	266 130	2.5	358

DELAWARE.

237 114	248 120	257 125	271 133	298 148	324 162	358 181	401 205	419 215	426 219	261 127	2.0	359
230 110	243 117	255 124	271 133	297 147	324 162	354 179	388 198	406 208	406 208	255 124		
237 114	246 119	253 123	270 132	284 140	311 155	356 180	419 215	444 229	464 240	268 131	1.1	361
252 122	259 126	266 130	280 138	297 147	316 158	345 174	381 194	401 205	417 214	273 134		
234 112	244 118	255 124	275 135	297 147	320 160	354 179	390 199	410 210	417 214	259 126	2.2	363

DISTRICT OF COLUMBIA.

212 100	230 110	248 120	270 132	311 155	345 174	417 214	.....	.....	417 214	232 111	8.6	1037
271 133	279 137	291 144	306 152	333 167	354 179	381 194	417 214	428 220	442 227	289 143		
234 112	257 125	270 132	291 144	311 155	338 170	378 192	432 222	.....	435 221	261 127	3.1	1039
257 125	266 130	273 134	298 148	315 157	334 168	365 185	394 201	406 208	419 215	277 136		
246 119	255 124	266 130	282 139	307 153	331 166	365 185	399 204	415 213	419 215	266 139	1.8	1041

TABLE 15.—Marketing data and analytical figures for gasolines

FLORIDA.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Retail.	Tank wagon.	Specific gravity.	Degrees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
364	Jacksonville.....	2	G., F..	26	23½	0.734	60.7	{ 120 49	156 69	171 77	187 86	201 94
365	do.....	2	D.....		23½	.731	61.8	{ 127 53	163 73	176 80	190 88	203 95
366	do.....	12	D.....		23½	.749	56.9	{ 122 50	169 76	189 87	217 103	237 114
367	do.....	12	F.....	26	23½	.750	56.7	{ 129 54	183 81	203 95	230 110	248 120
368	do.....	1	F.....	26	23½	.745	57.9	{ 124 51	167 75	183 84	212 100	230 110
369	do.....	1	D.....		23½	.745	57.9	{ 122 50	167 75	185 85	212 100	230 110
370	Pensacola.....	2	F.....	26	23½	.741	58.9	{ 122 50	149 65	163 73	189 87	208 98
371	do.....	2	D.....		23½	.741	58.9	{ 120 49	147 54	162 72	189 87	208 98
372	do.....	12	D.....		23½	.740	59.2	{ 118 48	149 65	167 75	198 92	221 105
373	do.....	12	F.....	26	23½	.748	57.2	{ 118 48	147 64	172 78	208 98	230 110
374	do.....	1	D.....		23½	.749	56.9	{ 127 53	167 75	187 86	214 101	235 113
375	do.....	1	D.....		23½	.749	56.9	{ 131 55	165 74	189 87	217 103	237 114
376	Tampa.....	2	D.....		23½	.743	58.4	{ 120 49	149 65	165 74	190 88	210 99
377	do.....	2	F.....	26	23½	.746	57.7	{ 127 53	158 70	172 78	198 92	219 104
378	do.....	12	D.....		23½	.749	56.9	{ 122 50	167 75	190 88	225 107	244 118
379	do.....	12	F.....	25	23½	.753	55.9	{ 124 51	167 75	192 89	223 106	243 117
380	do.....	1	D.....		23½	.746	57.7	{ 127 53	167 75	183 84	207 97	232 111
381	do.....	1	F.....	25	23½	.750	56.7	{ 135 57	169 76	185 85	212 100	234 112

GEORGIA.

382	Atlanta.....	28	F.....	26½	24½	0.741	58.9	{ 131 55	171 77	196 91	220 110	253 123
383	do.....	2	D.....	26½	24½	.748	57.2	{ 131 55	162 72	176 80	196 91	212 100
384	do.....	2	F.....	26½	24½	.748	57.2	{ 127 53	158 70	174 79	192 89	208 98
385	do.....	12	F.....	26½	24½	.744	58.2	{ 131 55	165 74	183 84	210 99	234 112
386	do.....	1	D.....	26½	24½	.740	59.2	{ 113 45	174 79	199 93	221 105	235 113

collected in the 1919 survey, arranged by States—Continued.

FLORIDA.

Distillation—Continued.											Distillation loss per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
212 100	217 103	223 106	234 112	252 122	275 135	315 157	356 180	374 190	399 204	235 113	1.5	364
216 102	221 105	226 108	239 115	255 124	277 136	311 155	345 174	356 180	376 191	235 113	1.4	365
257 125	262 128	271 133	289 143	307 153	333 167	363 184	388 198	399 204	419 215	273 134	1.0	366
262 128	273 134	279 137	298 148	316 158	342 172	374 190	401 205	410 210	414 212	282 139	2.0	367
250 121	257 125	266 130	266 141	304 151	325 163	356 180	392 200	399 204	403 206	266 130	1.9	368
270 121	257 125	266 130	284 140	302 150	324 162	356 180	392 200	401 205	403 206	266 130	2.0	369
228 109	239 115	250 121	271 133	291 144	322 161	363 184	412 211	426 219	430 221	259 126	2.5	370
228 109	239 115	248 120	270 132	293 145	322 161	365 185	417 214	433 223	433 223	259 126	2.7	371
243 117	252 122	266 130	284 140	302 150	329 165	370 188	410 210	424 218	424 218	264 129	2.3	372
250 121	259 126	268 131	277 136	311 155	334 168	378 192	441 227	 232	450 232	271 133	2.9	373
253 123	253 123	273 134	289 143	307 153	327 164	356 180	396 202	415 213	426 219	271 133	2.0	374
253 123	261 127	268 131	286 141	302 150	325 163	356 180	396 202	417 214	421 216	271 133	2.2	375
228 109	235 113	235 113	268 131	288 142	315 157	354 179	401 205	471 214	423 217	253 123	2.0	376
237 114	246 119	246 119	279 137	300 149	325 163	365 185	415 213	428 220	432 222	264 129	2.0	377
262 128	270 132	280 138	295 146	315 157	333 167	367 186	401 205	419 215	428 220	279 137	2.0	378
262 128	270 132	277 136	295 146	313 156	334 168	363 184	399 204	415 213	423 217	277 136	2.0	379
252 122	259 126	268 131	288 142	302 150	325 163	354 179	385 196	399 204	412 211	268 131	1.3	380
253 123	262 128	271 133	289 143	307 153	325 163	356 180	390 199	406 208	412 211	271 133	2.0	381

GEORGIA.

271 133	282 139	284 140	307 153	324 162	342 172	365 185	397 203	410 210	415 213	289 143	1.5	382
226 108	234 112	244 118	266 130	284 140	302 150	345 174	390 199	410 210	426 219	257 125	1.2	383
225 107	234 112	239 115	261 127	282 139	309 154	352 178	378 192	415 213	430 221	255 124	1.9	384
253 123	261 127	270 132	284 140	306 152	327 164	356 180	399 204	417 214	426 219	271 133	1.5	385
246 119	253 123	259 126	273 134	291 144	307 153	347 175	403 206	 206	403 206	262 128	4.0	386

126 QUALITY OF GASOLINE MARKETING IN UNITED STATES.

TABLE 15.—Marketing data and analytical figures for gasolines

GEORGIA—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
387	Atlanta.....	249	F.....	26½	24½	0.751	56.4	{ 133 56	160 71	172 78	190 88	207 97
388	Macon.....	2	F.....	26½		.750	56.7	{ 136 58	147 64	163 73	185 85	205 96
389	do.....	2	G.....	26½		.746	57.7	{ 122 50	147 64	165 74	187 86	207 97
390	do.....	143	G.....	26½		.741	58.9	{ 131 55	163 73	183 84	205 96	225 107
391	do.....	12	F.....	26½		.745	57.9	{ 129 54	162 72	180 82	210 99	232 111
392	do.....	1	F.....	26½		.751	56.4	{ 113 45	176 80	194 90	214 101	228 109
393	Savannah.....	2	D.....		23½	.734	60.7	{ 109 43	142 61	160 71	185 85	205 96
394	do.....	2	S.....	25½	23½	.739	59.4	{ 113 45	142 61	156 69	183 84	203 95
395	do.....	12	D.....		23½	.750	56.7	{ 140 60	190 88	210 99	232 111	252 122
396	do.....	12	F.....	25½		.750	56.7	{ 140 60	183 84	205 90	232 111	250 121
397	do.....	1	D.....		23½	.750	56.7	{ 147 64	183 84	199 93	219 104	239 115
398	do.....	1	F.....	25½	23½	.742	58.7	{ 124 51	162 72	181 83	208 98	230 110

IDAHO.

399	Boise.....	10	F.....	30	27½	0.755	55.4	{ 118 48	160 71	180 82	210 98	235 113
400	do.....	10	F.....	30	27½	.755	55.4	{ 122 50	167 75	183 84	201 94	212 100
401	do.....	14	D.....	30	27½	.755	55.4	{ 127 53	176 80	194 90	219 104	237 114

ILLINOIS.

402	Champaign.....	111	F.....	25		0.747	57.1	{ 138 59	178 81	190 88	212 100	230 110
403	do.....	6	G.....	25		.753	55.9	{ 136 58	178 81	198 92	225 107	244 118
404	do.....	3	F.....	23		.760	54.2	{ 118 48	154 68	174 79	207 97	243 117
405	Chicago.....	131	G.....	25	23	.821	40.5	{ 158 70	172 78	176 80	181 83	185 85
406	do.....	175	F.....	23		.757	54.9	{ 140 60	185 85	202 94	207 109	248 120
407	do.....	208	F.....	23		.872	30.6	{ 160 76	183 84	187 86	189 87	190 88

collected in the 1919 survey, arranged by States—Continued.

GEORGIA—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
228 109	239 115	248 120	273 134	302 150	331 166	372 189	419 215	442 228	464 240	264 129	1.4	387
223 106	232 111	241 116	266 130	299 143	322 161	370 188	414 212	430 221	439 226	259 126	1.8	388
226 108	234 112	244 118	264 129	293 145	325 163	369 187	412 211	426 219	441 227	259 126	1.8	389
241 116	250 121	261 127	279 137	306 152	338 170	381 194	415 213	437 225	453 234	273 134	1.8	390
252 122	262 128	273 134	295 146	316 158	343 173	385 196	426 219	446 230	453 234	279 137	1.6	391
241 116	250 121	259 126	273 134	291 144	311 155	342 172	378 192	394 201	415 213	262 128	1.5	392
225 107	232 111	241 116	262 128	282 139	311 155	352 178	401 205	415 213	415 213	250 121	2.5	393
221 105	230 110	243 117	264 129	284 140	315 157	354 179	401 205	410 210	410 210	250 121	2.0	394
266 130	275 135	280 138	300 149	318 159	336 169	367 186	399 204	410 210	419 215	281 140	1.2	395
266 130	273 134	282 139	298 148	316 158	333 167	367 186	392 200	406 208	419 215	282 139	1.2	396
255 124	262 128	271 133	288 142	311 155	329 165	358 181	385 196	396 202	406 208	275 135	1.0	397
250 121	259 126	270 132	286 141	307 153	327 164	367 186	287 197	297 203	401 205	270 132	1.2	398

IDAHO.

252 122	266 130	282 139	306 152	329 165	365 185	410 210	457 236	473 245	475 246	288 142	2.1	399
223 106	226 108	232 111	243 117	253 123	268 131	293 145	320 160	334 168	352 175	235 113	.4	400
253 123	261 127	273 134	289 143	311 155	336 169	381 194	428 220	433 223	433 223	277 136	2.3	401

ILLINOIS.

244 118	253 123	262 128	279 137	293 145	325 163	361 183	403 206	419 216	441 227	271 133	0.8	402
264 129	271 133	284 140	308 153	331 166	356 180	394 201	426 219	437 225	455 235	291 144	.8	403
271 133	289 143	306 152	334 168	361 183	390 199	421 216	444 229	451 233	457 236	298 148	1.6	404
189 87	192 89	196 91	208 98	234 112	291 144	360 182	408 209	426 219	446 230	239 115	.8	405
268 131	279 137	288 142	311 155	333 167	363 184	414 212	457 236	464 240	475 246	297 147	1.7	406
192 89	194 90	196 91	199 93	207 97	216 102	230 110	239 115	244 118	277 136	265 96	.5	407

TABLE 15.—Marketing data and analytical figures for gasolines

ILLINOIS—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Retail.	Tank wagon.	Specific gravity.	Degrees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
408	Chicago.....	206	G.....	23	20½	.757	54.9	{ 104 40	140 60	158 70	185 85	205 96
409	do.....	217	G.....	20½	.....	.860	32.8	{ 167 75	178 81	180 82	181 83	183 84
410	do.....	4	F.....	23	.....	.750	56.7	{ 113 45	158 70	180 82	207 97	228 109
411	do.....	4	G.....	25	20½	.757	54.9	{ 115 46	158 70	181 82	208 98	230 110
412	do.....	3	F.....	23	.....	.760	54.2	{ 100 38	129 54	147 64	185 85	225 107
413	do.....	3	F.....	23	.....	.759	54.5	{ 90 32	131 55	153 67	180 80	222 111
414	do.....	1	G.....	23	.....	.757	54.9	{ 100 38	140 60	160 71	187 86	208 98
415	do.....	1	G.....	23	.....	.759	54.5	{ 102 39	144 62	163 73	192 89	217 103
416	do.....	80	D.....	23	21	.741	58.9	{ 113 45	144 62	169 76	196 91	217 103
417	Peoria.....	104	F.....	23	22	.747	57.4	{ 126 52	160 71	183 84	207 97	226 108
418	do.....	104	F.....	26	25	.745	57.9	{ 102 39	140 60	163 73	194 90	219 104
419	do.....	104	F.....	28	27	.726	62.8	{ 97 36	126 52	144 62	174 79	190 93
420	do.....	8	D.....	.....	.....	.748	57.2	{ 133 56	174 79	192 89	214 101	230 110
421	do.....	3	F.....	23	.....	.752	56.2	{ 111 44	140 60	162 72	198 92	232 111
422	East Peoria.....	232	F.....	23	.....	.755	55.9	{ 160 71	205 86	225 107	241 116	253 123
423	Rock Island.....	48	F.....	23	.....	.744	58.2	{ 129 54	180 82	194 90	214 101	230 110
424	do.....	48	F.....	25	.....	.745	57.9	{ 140 60	176 80	192 89	210 99	226 108
425	do.....	48	F.....	30	.....	.712	66.6	{ 104 40	127 53	142 61	158 70	174 79
426	do.....	180	F.....	23.2	.....	.750	56.7	{ 118 48	156 69	178 81	205 96	232 111
427	do.....	180	F.....	27	.....	.739	59.4	{ 113 45	144 62	162 72	189 87	212 100
428	do.....	180	F.....	31	.....	.719	64.7	{ 90 32	109 43	118 48	140 60	162 72
429	do.....	4	F.....	23.2	.....	.751	56.4	{ 113 45	162 72	185 85	212 100	232 111
430	do.....	4	F.....	29.2	.....	.730	61.8	{ 133 56	160 71	169 76	185 85	198 92
431	do.....	3	F.....	23.2	.....	.755	55.4	{ 108 42	145 63	167 75	208 98	243 117

collected in the 1919 survey, arranged by States—Continued.

ILLINOIS—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
228 109	211 116	218 120	273 131	297 147	320 160	352 178	381 194	396 202	405 207	252 122	1.4	498
187 86	189 87	190 88	198 92	217 103	295 146	406 208	446 230	455 235	469 243	243 117	.5	409
248 120	257 125	286 130	286 141	307 153	333 167	372 189	415 213	428 220	430 221	270 132	2.1	410
250 121	259 126	286 130	280 142	309 154	334 168	370 188	412 211	428 220	432 222	271 133	1.2	411
246 130	284 140	304 151	342 172	367 186	394 201	419 215	444 229	.....	444 229	289 143	3.3	412
275 135	291 144	309 154	336 169	370 188	396 202	423 217	442 228	453 234	453 234	293 145	2.7	413
230 110	243 117	253 123	277 136	298 148	322 161	352 178	381 194	397 203	410 210	255 124	1.5	414
237 114	248 120	257 125	277 136	302 150	327 164	360 182	387 197	405 207	412 211	259 126	2.0	415
239 115	248 120	259 126	280 138	302 150	329 165	367 186	410 210	424 218	433 223	264 129	1.5	416
248 120	257 125	270 132	316 158	325 163	356 180	410 210	464 240	482 250	482 250	286 141	1.6	417
241 116	252 122	270 132	273 145	320 160	352 178	408 209	473 245	.....	477 247	277 136	3.1	418
221 105	228 109	239 115	261 127	284 140	311 155	352 178	397 203	.....	403 206	244 118	3.0	419
244 118	252 122	262 128	280 138	302 150	325 163	358 181	397 203	406 208	428 220	270 132	.8	420
261 127	279 137	291 144	329 165	352 178	385 196	419 215	450 232	460 238	460 238	291 144	2.5	421
266 130	275 135	284 140	298 148	315 157	340 171	372 189	419 215	433 223	442 228	291 144	1.8	422
246 119	253 123	259 126	277 136	297 147	316 158	347 175	381 194	392 200	412 211	266 130	.7	423
241 116	250 121	255 124	273 134	291 144	315 157	345 174	379 193	396 202	410 210	264 129	1.5	424
190 88	198 92	207 97	219 104	237 114	255 124	302 150	352 178	374 190	383 195	212 100	1.8	425
259 126	271 133	286 141	307 153	322 161	343 178	397 203	432 222	444 229	455 235	282 139	1.0	426
235 113	248 120	257 125	280 138	309 154	340 171	385 196	424 218	437 225	450 232	266 130	2.1	427
185 85	199 92	212 100	239 115	268 131	288 155	311 183	419 215	430 221	430 221	228 109	2.7	428
252 122	262 128	273 134	293 145	316 158	342 172	379 193	415 213	426 219	446 230	277 136	.7	429
210 99	216 102	223 106	235 113	250 121	273 124	309 154	347 175	365 185	378 192	234 112	1.6	430
262 128	284 140	298 148	320 160	343 173	370 188	403 206	432 222	441 227	442 228	288 142	1.6	431

TABLE 15.—Marketing data and analytical figures for gasolines

ILLINOIS—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
432	Springfield.....	6	D.....	23	.....	0.733	55.9	{ 131 55	172 78	192 89	216 102	235 113
433	do.....	8	D.....	26	26	.756	55.2	{ 136 58	181 82	201 94	223 106	241 116
434	do.....	201	D.....	23	.....	.746	57.7	{ 147 64	192 89	205 96	228 109	239 115
435	do.....	3	F.....	23	.....	.746	57.7	{ 102 39	144 62	167 75	203 95	232 111
436	do.....	3	D.....	.....	23	.751	56.4	{ 91 33	129 54	158 70	199 93	243 117
437	Urbana.....	6	F.....	25	.....	.754	55.7	{ 120 49	167 75	189 87	210 99	234 112
438	do.....	8	F.....	30	.....	.749	56.9	{ 124 51	171 77	183 84	201 94	214 101
439	do.....	3	F.....	23	.....	.753	55.9	{ 102 39	135 57	156 69	196 91	232 111

INDIANA.

440	Fort Wayne.....	6	G.....	28	.....	0.721	64.2	{ 86 30	115 46	131 55	162 72	192 89
441	do.....	4	G.....	23	.....	.738	59.7	{ 108 42	151 66	174 79	203 95	225 107
442	do.....	4	F.....	23	.....	.738	59.7	{ 117 47	167 75	189 87	216 102	234 112
443	do.....	3	F.....	23	.....	.735	60.5	{ 91 33	140 60	169 76	207 97	243 117
444	Indianapolis.....	109	D.....	30	25½	.732	61.3	{ 124 51	158 70	172 78	194 90	208 98
445	do.....	141	F.....	25	23	.792	46.8	{ 140 60	174 79	181 83	189 87	198 92
446	do.....	141	D.....	27	.....	.745	57.9	{ 140 60	167 75	180 82	194 90	208 98
447	do.....	141	D.....	25	.....	.796	45.9	{ 154 68	174 79	180 82	189 87	196 91
448	do.....	6	D.....	25	.....	.749	56.9	{ 106 41	144 62	165 74	199 93	223 106
449	do.....	6	D.....	24	.....	.751	56.4	{ 117 47	151 66	176 80	207 97	230 110
450	do.....	8	D.....	28	26	.749	56.9	{ 117 47	153 67	176 80	210 99	243 117
451	do.....	3	F.....	23	23	.755	55.4	{ 115 46	140 60	158 70	192 89	237 114
452	do.....	78	G.....	25	23	.748	57.2	{ 99 37	127 53	153 67	194 90	228 109
453	do.....	244	F.....	24	24	.752	56.2	{ 142 61	180 82	196 91	216 102	232 111
454	do.....	244	F.....	27	26	.735	60.5	{ 113 45	145 63	162 72	185 85	205 95

collected in the 1919 survey, arranged by States—Continued.

ILLINOIS—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
252 122	262 128	271 133	291 144	315 157	342 172	383 195	432 222	444 229	462 239	280 138	0.8	432
255 124	264 129	273 134	289 143	306 152	327 164	356 180	387 197	396 202	412 211	275 135		
259 126	264 129	271 133	286 141	302 150	320 160	345 174	370 188	383 195	403 206	273 134	1.0	434
250 121	271 133	284 140	316 158	345 174	378 192	426 219	482 250	..... .....	484 251	280 143		
266 130	297 147	313 156	345 174	372 189	399 204	437 225	..... .....	..... .....	464 240	298 148	1.3	436
255 124	266 130	280 138	304 151	325 163	349 176	388 198	421 216	426 219	448 231	282 139		
226 108	235 113	244 118	264 129	284 140	300 149	334 168	361 183	370 188	390 199	252 122	.8	438
250 121	284 140	298 148	333 167	361 183	392 200	423 217	455 235	..... .....	455 235	291 144		

INDIANA.

230 110	246 119	266 130	298 148	351 177	388 198	448 231	.....	.....	475 246	275 135	4.9	440
244 118	255 124	266 130	288 142	309 154	334 168	376 191	414 212	414 212	414 212	268 131		
252 122	261 127	273 134	295 146	316 158	342 172	379 193	419 215	433 223	439 226	277 136	1.7	442
273 134	288 142	307 153	336 169	361 183	388 198	421 216	450 232	460 238	462 239	297 147		
223 106	230 110	239 115	255 124	273 134	302 150	338 170	374 190	390 199	406 208	248 120	1.5	444
207 97	212 100	217 103	235 113	262 128	306 152	349 176	388 198	403 206	417 214	246 119		
219 104	225 107	234 112	248 120	270 132	293 145	327 164	358 181	365 185	401 205	248 120	.8	446
203 95	208 98	217 103	232 111	264 129	318 159	363 184	399 204	408 209	426 219	250 121		
246 119	259 126	268 131	291 144	324 162	351 177	401 205	446 230	460 238	471 244	277 136	1.7	448
252 122	264 129	277 136	302 150	331 166	367 186	417 214	468 242	.....	471 244	286 141		
268 131	282 139	297 147	311 155	338 170	361 183	394 201	424 218	439 226	441 227	288 142	1.3	450
275 135	293 145	304 151	329 165	358 181	385 196	421 216	450 232	457 236	490 238	295 146		
257 125	268 131	282 139	306 152	325 163	352 178	405 207	455 235	473 245	475 246	280 138	2.0	452
248 120	257 125	266 130	282 139	307 153	336 169	378 192	417 214	432 222	457 236	279 137		
219 104	228 109	235 113	250 121	279 137	300 154	349 176	392 200	405 207	424 218	248 120	.8	454

TABLE 15.—Marketing data and analytical figures for gasolines

IOWA.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
455	Davenport.....	48	F.....	23.2	.....	.744	58.2	{ 135 56	156 80	190 88	212 100	226 108
456	do.....	48	F.....	25	.....	.746	57.7	{ 121 55	171 77	190 88	210 99	228 109
457	do.....	48	F.....	30	.....	.714	66.1	{ 104 40	131 55	144 62	160 71	176 80
458	do.....	180	D.....	23.2	.....	.754	55.7	{ 133 56	174 79	194 90	217 103	239 115
459	do.....	180	D.....	27	.....	.737	60.0	{ 111 44	145 63	162 72	187 86	210 99
460	do.....	180	D.....	31	.....	.712	66.6	{ 100 38	117 47	127 53	144 62	169 76
461	do.....	4	F.....	23.2	.....	.753	55.9	{ 122 50	132 72	185 85	212 100	230 110
462	do.....	4	F.....	29.2	.....	.730	61.8	{ 131 55	156 69	167 75	181 83	194 90
463	do.....	3	F.....	23.2	.....	.754	55.7	{ 113 45	145 63	165 74	207 97	244 118
464	Des Moines.....	111	G.....	23	22.9	.752	56.2	{ 118 48	171 77	201 94	234 112	255 124
465	do.....	34	S.....	26	22.9	.750	56.7	{ 153 67	185 85	196 91	219 104	235 113
466	do.....	133	D.....	23	22.9	.750	56.7	{ 145 63	189 87	205 96	228 109	244 118
467	do.....	146	F.....	23	22.9	.742	58.7	{ 113 45	149 65	169 76	210 99	235 113
468	do.....	149	F.....	23	22.9	.743	58.4	{ 147 64	190 88	203 95	226 108	243 117
469	do.....	162	G.....	23	22.9	.794	46.3	{ 149 65	212 100	250 121	307 153	351 177
470	do.....	170	F.....	23	22.9	.748	57.2	{ 100 38	127 53	147 64	192 89	239 115
471	do.....	3	F.....	22.9	22.9	.750	56.7	{ 113 45	147 64	167 75	205 96	235 113
472	do.....	3	F.....	28	28	.....	.....	{ 93 34	117 47	131 55	162 72	196 91

KANSAS.

473	Parsons.....	178	G.....	23	.....	.718	57.2	{ 149 65	181 83	196 91	219 104	237 114
474	do.....	3	F.....	22½	.....	.753	55.9	{ 118 48	156 69	189 87	225 107	253 123
475	do.....	45	F.....	22½	.....	.746	57.7	{ 140 60	172 78	185 85	205 96	225 107
476	Topeka.....	110	F.....	25½	21½	.740	59.2	{ 145 63	178 81	192 89	212 100	228 109
477	do.....	11	F.....	24	23	.746	57.7	{ 113 45	160 71	183 84	216 102	237 114

collected in the 1919 survey, arranged by States—Continued.

IOWA.

Distillation—continued											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
243 117	250 121	255 124	275 135	293 145	313 156	343 173	369 187	374 190	397 203	262 128	0.8	455
244 118	252 122	261 127	273 134	297 147	315 157	351 177	385 196	401 205	423 217	266 130	.8	456
192 89	199 93	207 97	221 105	237 114	261 127	302 150	347 175	367 186	399 199	217 103	2.0	457
261 127	270 132	277 136	300 149	324 162	352 178	394 201	426 219	439 226	450 232	286 141	.6	458
230 110	239 115	244 118	273 134	300 149	333 167	381 194	417 214	426 219	439 226	261 127	1.6	459
162 89	203 95	216 102	237 114	270 132	307 153	374 190	.....	.....	428 220	234 112	4.0	460
248 120	259 126	271 133	293 145	315 157	342 172	383 195	423 217	437 225	442 228	277 136	1.3	461
208 98	214 101	223 106	234 112	250 121	268 131	307 153	352 178	370 188	376 191	230 110	2.0	462
273 134	288 142	302 150	320 160	343 173	365 185	399 204	428 220	441 227	450 232	289 143	1.7	463
275 135	289 143	298 148	320 160	345 174	372 189	417 214	468 242	484 251	489 254	302 150	1.6	464
253 123	262 128	270 132	289 143	309 154	333 167	370 188	405 207	419 215	437 225	279 137	1.0	465
261 127	270 132	277 136	293 145	315 157	338 170	379 193	437 225	455 235	478 248	288 142	1.0	466
253 123	262 128	273 134	291 144	306 152	338 170	374 190	417 214	433 223	444 229	275 135	2.0	467
257 125	264 129	270 132	284 140	297 147	320 160	349 176	383 195	397 203	419 215	273 134	1.0	468
387 197	396 202	415 213	435 224	453 234	484 251	505 263	(¹)	(¹)	(¹)	.....	2.5	469
280 138	297 147	320 160	356 180	392 200	341 227	505 263	(¹)	(¹)	(¹)	.....	4.0	470
259 126	271 133	282 139	307 153	336 169	363 184	415 213	457 236	477 247	477 247	288 142	2.1	471
226 108	241 116	259 126	297 147	329 165	369 187	428 220	.....	.....	471 244	270 132	4.8	472

KANSAS.

255 124	248 120	275 135	295 146	315 157	336 169	370 188	399 204	410 210	419 215	279 137	0.9	473
275 135	284 140	298 148	322 161	345 174	372 189	415 213	464 240	.....	464 240	298 148	3.1	474
243 117	252 122	261 127	284 140	309 154	338 170	388 198	433 223	446 230	451 233	275 135	1.1	475
243 117	252 122	259 126	277 136	293 145	318 159	343 173	369 187	379 193	394 201	264 129	.8	476
255 124	264 129	273 134	293 145	313 156	336 169	369 187	408 209	414 212	414 212	273 134	3.3	477

¹ Limit of thermometer.

TABLE 15.—Marketing data and analytical figures for gasolines

KANSAS—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
478	Topeka.....	55	F., D.	25½	24½	0.738	59.7	{ 118 48	140 60	167 75	190 88	210 99
479	do.....	59	F.....	22.7	21.7	.745	57.9	{ 144 62	183 84	199 93	223 106	243 117
480	do.....	8	F.....	25½	24½	.751	56.4	{ 151 66	189 87	199 93	217 103	230 110
481	do.....	4	D.....	22.7	21.7	.747	57.4	{ 108 42	144 62	167 75	198 92	225 107
482	do.....	4	F.....	22.7	21.7	.749	56.9	{ 120 49	167 75	185 85	210 99	230 110
483	do.....	3	F.....	22.7	22.7	.747	57.4	{ 102 39	140 60	163 73	203 95	239 115
484	do.....	88	F.....	25½	24½	.737	60.0	{ 154 68	167 75	178 81	190 88	201 92
485	do.....	88	F.....	22.7	21.7	.750	56.7	{ 147 64	180 82	194 90	205 96	219 104
486	do.....	89	D.....	22.7	21.7	.746	57.7	{ 149 65	190 88	207 97	226 108	243 117
487	do.....	217	F.....	25½	24½	.738	59.7	{ 117 47	153 67	171 77	198 92	217 103
488	do.....	217	F.....	22.7	21.7	.747	57.4	{ 131 55	181 83	201 94	226 108	243 117
489	do.....	217	F.....	25½	24½	.738	59.7	{ 122 50	154 68	171 77	196 91	216 102
490	do.....	217	F.....	22.7	21.7	.748	57.2	{ 138 59	181 83	201 94	223 106	243 117
491	Wichita.....	11	F.....	24	22½	.744	58.2	{ 163 73	196 91	208 98	225 107	239 115
492	do.....	44	F.....	22.7	21.7	.752	56.2	{ 154 68	190 88	203 95	223 106	239 115
493	do.....	8	F.....	25½	25½	.750	56.7	{ 149 65	183 84	196 91	217 103	234 112
494	do.....	4	F.....	22.7	22.7	.748	57.2	{ 120 49	162 72	187 86	217 103	237 114
495	do.....	3	F.....	22.7	22.7	.751	56.4	{ 117 47	162 72	185 85	217 103	241 116
496	do.....	88	F.....	22.7	.....	.753	55.9	{ 160 71	189 87	203 95	223 106	243 117

KENTUCKY.

497	Lexington.....	2	F.....	27	24½	0.742	58.7	{ 108 42	145 63	165 74	201 94	212 100
498	do.....	6	D.....	26½	24½	.755	55.4	{ 126 52	167 75	187 86	219 104	239 115
499	do.....	6	G.....	28	24½	.732	61.3	{ 104 40	124 51	138 59	167 75	199 93
500	do.....	17	D.....	26½	26½	.744	58.2	{ 133 56	172 78	192 89	219 104	239 115

collected in the 1919 survey, arranged by States—Continued.

KANSAS—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
232 111	234 112	252 122	275 135	300 149	334 168	379 193	423 217	435 224	435 234	262 128	1.8	478
255 124	264 129	271 133	289 143	307 153	329 165	352 178	381 194	390 199	410 210	275 135	.7	479
246 119	253 123	257 125	279 137	293 145	311 155	343 173	372 189	385 196	403 206	266 130	.8	480
234 112	243 117	255 124	271 133	298 148	324 162	363 184	417 214	421 216	421 216	261 127	2.6	481
248 120	257 125	266 130	288 142	311 155	334 168	367 186	405 207	417 214	428 220	271 133	1.7	482
270 132	277 136	298 148	325 163	356 180	385 196	432 222	462 239	.....	462 239	295 146	4.7	483
216 102	223 106	232 110	244 118	262 128	291 144	329 165	363 184	379 193	406 208	246 119	.4	484
235 113	246 119	271 133	288 142	313 156	343 173	392 200	437 225	441 227	442 228	277 136	.8	485
257 125	264 129	270 132	289 143	315 157	336 169	372 189	408 209	419 215	424 218	280 138	1.6	486
237 114	246 119	237 114	279 137	304 151	331 166	374 190	421 216	433 223	433 223	264 129	2.2	487
262 125	271 133	282 139	300 149	318 159	340 171	374 190	408 209	423 217	428 220	282 139	1.7	488
235 113	244 118	253 123	282 139	307 153	336 169	381 194	423 217	433 223	433 223	266 130	1.9	489
257 125	266 130	273 134	295 146	311 155	336 169	370 188	405 207	414 212	424 218	279 137	1.6	490
252 122	261 127	268 131	282 139	298 148	316 158	347 175	379 193	392 200	417 214	275 135	.8	491
253 125	266 130	275 135	297 147	316 158	343 173	381 194	419 215	430 221	442 228	284 140	.8	492
248 120	255 124	264 129	279 137	295 146	315 157	347 175	383 195	399 204	415 213	270 132	1.2	493
255 124	266 130	277 136	295 146	316 158	342 172	379 193	426 219	.....	430 221	279 137	2.7	494
264 129	270 132	286 141	306 152	331 166	356 180	397 203	437 225	.....	446 230	286 141	2.2	495
259 126	268 131	277 136	298 148	311 155	345 174	387 197	430 221	441 227	448 231	286 141	.7	496

KENTUCKY.

230 110	239 115	248 120	268 131	293 145	324 162	370 188	414 212	428 220	428 220	259 126	2.4	497
261 127	273 134	280 138	307 153	329 165	361 183	410 210	457 236	471 244	482 250	291 144	1.6	498
226 108	239 115	253 123	284 140	322 161	369 187	433 222	496 258	.....	496 258	271 133	2.9	499
257 125	262 128	275 135	297 147	318 159	342 172	381 194	410 210	432 222	432 222	280 138	1.9	500

TABLE 15.—Marketing data and analytical figures for gasolines

KENTUCKY—Continued.

Sample No.	City.	Company No.	Sample collected from	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
501	Lexington.....	228	D.....	26½	24½	.740	59.2	{ 136 58	185 85	205 96	228 109	248 118
502	do.....	228	G.....	28	24½	.743	58.4	{ 158 70	212 100	228 109	246 119	257 125
503	Louisville.....	123	G.....	25½	.....	.746	57.7	{ 115 46	153 67	176 80	203 95	226 108
504	do.....	2	G.....	25½	.....	.738	59.7	{ 113 45	147 64	165 74	190 88	208 98
505	do.....	12	F.....	25½	24½	.738	59.7	{ 140 60	160 71	177 77	190 88	212 100
506	do.....	228	D.....	26	.....	.733	61.0	{ 115 46	151 66	167 75	189 87	210 99
507	do.....	157	D.....	25½	23½	.748	57.2	{ 81 27	106 41	127 53	176 80	230 110

LOUISIANA.

508	Baron Rouge....	1	F.....	24	.....	.749	56.9	{ 131 55	180 82	196 91	217 103	234 112
509	do.....	1	F.....	24	.....	.751	56.4	{ 129 54	178 81	194 90	216 102	237 114
510	do.....	17	G.....	24	24	.748	57.2	{ 126 52	180 82	199 93	221 105	243 117
511	do.....	17	G.....	24	24	.748	57.2	{ 131 55	174 79	196 91	221 105	239 115
512	New Orleans.....	28	D.....	23	21	.745	57.9	{ 154 68	178 81	208 98	230 110	246 119
513	do.....	40	F.....	24	22	.740	59.2	{ 131 55	160 71	176 80	198 92	219 104
514	do.....	2	D.....	23	.....	.747	57.4	{ 113 45	147 64	163 73	187 86	207 97
515	do.....	6	F.....	23	21	.751	56.4	{ 131 55	172 78	187 86	217 103	239 115
516	do.....	56	F.....	23	.....	.746	57.7	{ 129 54	165 74	180 78	203 95	221 105
517	do.....	17	F.....	23	21	.752	56.2	{ 149 65	181 83	194 90	212 100	230 110
518	do.....	1	F.....	23	.....	.748	57.2	{ 113 45	165 74	189 87	221 105	239 115
519	Shreveport.....	28	F.....	24	22	.741	58.9	{ 136 58	174 79	190 88	217 103	235 113
520	do.....	28	T.....	24	24	.740	59.2	{ 136 58	167 75	189 87	219 104	241 116
521	do.....	2	F.....	24	23	.743	58.4	{ 115 46	142 61	156 69	180 82	198 92
522	do.....	57	F.....	24	.....	.746	57.7	{ 174 79	201 94	212 100	226 108	241 116
523	do.....	57	F.....	24	24	.747	57.4	{ 171 77	203 95	212 100	228 109	243 117

collected in the 1919 survey, arranged by States—Continued.

KENTUCKY—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
261 127	264 129	275 135	291 144	309 154	329 165	361 183	394 201	406 308	430 221	279 137	2.0	501
264 129	277 136	284 140	298 148	313 156	331 166	365 185	401 205	412 211	424 218	288 142		
248 129	261 127	266 130	289 143	311 155	338 170	381 194	412 211	423 217	441 227	273 134	.5	503
228 109	235 113	244 118	361 127	279 137	307 153	347 175	385 196	396 202	414 212	250 121		
234 112	243 117	252 122	275 135	300 149	327 164	360 182	392 200	403 206	415 213	262 128	1.0	505
228 109	235 113	244 118	262 128	286 141	313 156	345 174	379 193	390 199	410 210	252 122		
304 151	333 167	363 184	403 206	437 225	468 242	518 270	.....	.....	520 271	329 165	6.9	507

LOUISIANA.

253 123	277 125	271 133	288 142	306 152	329 165	361 183	392 200	403 206	421 216	273 134	1.0	508
273 123	244 128	275 135	289 143	315 157	338 170	387 186	410 210	424 218	435 224	277 136		
262 128	266 130	280 138	297 147	315 157	336 169	365 185	392 200	403 206	419 215	279 137	1.4	510
275 124	266 130	266 130	291 144	311 155	334 168	363 184	388 198	399 204	414 212	275 135		
264 129	270 132	279 137	293 145	320 160	343 173	374 190	401 205	410 210	430 221	286 141	.6	512
237 114	248 120	255 124	275 135	307 153	334 168	376 191	417 214	430 221	439 226	268 131		
212 100	228 109	243 117	262 128	289 143	320 160	363 184	410 210	423 217	423 217	273 123	2.8	514
266 130	273 134	289 143	311 155	336 169	361 183	403 206	453 234	459 237	462 239	291 144		
241 116	248 120	259 126	282 139	307 153	334 168	372 189	414 212	419 215	433 223	270 132	1.6	516
248 120	253 123	261 127	284 140	307 153	331 166	361 183	408 209	426 219	439 226	275 135		
257 125	264 129	275 135	293 145	316 159	322 161	363 184	396 202	410 210	421 216	273 134	1.8	518
259 126	268 131	275 135	297 147	316 158	338 170	370 188	401 205	414 212	423 217	279 137		
261 127	271 133	279 137	298 148	320 160	345 174	378 192	408 209	419 215	419 215	280 138	1.8	520
217 103	226 108	235 113	261 127	284 140	316 158	361 183	410 210	.....	417 214	250 121		
277 125	262 128	270 132	282 139	302 150	320 160	351 177	383 195	392 200	403 206	277 136	1.2	522
257 125	264 129	271 133	288 142	304 151	324 162	354 179	387 197	397 203	414 212	279 137		

TABLE 15.—Marketing data and analytical figures for gasolines
LOUISIANA—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
524	Shreveport.....	9	F.....	24	22	0.746	57.7	{ 144 62	{ 181 83	{ 196 91	{ 219 104	{ 239 115
525	do.....	17	F.....	24	24	.749	56.9	{ 144 62	{ 181 83	{ 201 94	{ 225 107	{ 244 118
526	do.....	1	D.....		22	.747	57.4	{ 118 48	{ 163 73	{ 185 85	{ 219 104	{ 241 116
527	do.....	1	F.....	24	22	.748	57.2	{ 111 44	{ 154 68	{ 178 81	{ 210 99	{ 232 111

MAINE.

528	Augusta.....	5	G.....	27½	25½	0.740	59.2	{ 129 54	{ 167 75	{ 185 85	{ 214 101	{ 234 112
529	do.....	21	G.....	27½		.739	59.4	{ 126 52	{ 165 74	{ 187 86	{ 214 101	{ 235 113
530	Bangor.....	2	S.....	29	26	.733	61.0	{ 104 40	{ 138 59	{ 158 70	{ 189 87	{ 216 102
531	do.....	2	S.....	28	25½	.733	61.0	{ 109 43	{ 140 60	{ 160 71	{ 192 89	{ 219 104
532	do.....	5	G.....	28½	24½	.750	56.7	{ 151 66	{ 192 89	{ 210 99	{ 230 110	{ 252 122
533	do.....	5	G.....	30	25½	.742	58.7	{ 138 59	{ 176 80	{ 196 91	{ 225 107	{ 239 115
534	Portland.....	2	S.....	27½	25½	.728	62.3	{ 97 36	{ 127 53	{ 154 68	{ 181 83	{ 212 100
535	do.....	5	S.....	28	25½	.740	59.2	{ 131 55	{ 172 78	{ 187 86	{ 210 99	{ 228 109
536	do.....	1	F.....	27½	25½	.749	56.9	{ 169 43	{ 144 62	{ 165 74	{ 194 90	{ 214 101
537	do.....	21	G.....	28	25½	.743	58.4	{ 129 54	{ 174 79	{ 192 89	{ 219 104	{ 241 116
538	do.....	83	F.....	27½	25½	.722	63.9	{ 149 65	{ 181 83	{ 190 88	{ 203 95	{ 216 102

MARYLAND.

539	Baltimore.....	96	S.....	25	22½	0.752	56.2	{ 127 53	{ 165 74	{ 187 86	{ 217 103	{ 235 113
540	do.....	96	G.....	27	22½	.753	55.9	{ 133 56	{ 165 74	{ 189 87	{ 214 101	{ 235 113
541	do.....	18	D.....		22½	.754	55.7	{ 145 63	{ 178 81	{ 192 89	{ 210 99	{ 228 109
542	do.....	257	D.....		22½	.748	57.2	{ 149 65	{ 190 88	{ 199 93	{ 226 108	{ 250 121
543	do.....	204	D.....		22½	.741	58.9	{ 138 59	{ 176 80	{ 190 88	{ 214 101	{ 232 111
544	do.....	218	S.....	24	22½	.745	57.9	{ 153 67	{ 190 88	{ 207 97	{ 234 112	{ 255 124
545	do.....	7	S.....	25	22½	.741	58.9	{ 140 60	{ 174 79	{ 190 88	{ 214 101	{ 232 111
546	do.....	252	T.....	31	25	.816	51.0	{ 142 61	{ 147 64	{ 149 65	{ 153 67	{ 154 68

collected in the 1919 survey, arranged by States—Continued.

LOUISIANA—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
259 126	270 132	273 134	298 148	318 159	340 171	379 193	419 215	428 220	433 223	282 139	1.7	524
261 127	273 134	282 139	300 149	316 158	340 171	372 189	408 209	417 214	417 214	284 140		
257 125	266 130	273 134	288 142	311 155	336 169	376 191	.....	.....	421 216	275 135	3.9	526
252 122	261 127	271 133	286 141	311 155	322 161	369 187	424 218	.....	424 218	270 132		

MAINE.

252 122	259 126	268 131	289 143	309 154	329 165	361 183	394 201	403 206	415 213	271 133	1.2	528
253 123	261 127	270 132	282 139	302 150	326 163	360 182	392 200	405 207	408 209	270 132		
237 114	248 120	262 128	284 140	306 152	329 165	367 186	414 212	.....	415 213	261 127	3.0	530
241 116	252 122	264 129	284 140	306 152	331 166	374 190	419 215	.....	421 216	264 129		
264 129	273 134	282 139	298 148	315 157	342 172	367 186	397 203	406 208	421 216	284 140	1.0	532
255 124	262 128	270 132	286 141	302 150	326 163	356 180	388 198	401 205	408 209	273 134		
239 115	250 121	261 127	282 139	306 152	334 168	383 195	.....	.....	428 220	261 127	4.0	534
244 118	253 123	261 127	277 136	295 146	320 160	352 178	383 195	394 201	408 209	264 129		
234 112	244 118	255 124	279 137	302 150	327 164	374 190	410 210	.....	415 213	261 127	2.5	536
255 124	264 129	273 134	288 142	309 154	333 167	363 184	396 202	403 206	414 212	275 135		
226 108	234 112	239 115	252 122	264 129	282 139	306 152	331 166	345 174	360 182	244 118	1.0	538

MARYLAND.

255 124	264 129	271 133	291 144	309 154	334 168	363 184	401 205	414 212	423 217	273 134	1.2	539
253 123	262 128	268 131	293 145	311 155	333 167	365 185	399 204	417 214	419 215	273 134		
243 117	250 121	259 126	275 135	293 145	315 157	351 177	383 195	406 208	423 217	266 130	1.5	541
250 121	280 138	291 144	309 154	331 166	352 178	383 195	410 210	421 216	437 225	289 143		
248 120	259 126	266 130	282 139	300 149	322 161	352 178	381 194	394 201	412 211	270 132	1.5	543
275 135	286 141	297 147	318 159	336 169	358 181	390 199	419 215	432 222	446 230	297 147		
246 119	255 124	263 128	277 136	286 141	313 156	342 172	379 193	397 203	405 207	264 129	2.0	545
156 69	158 70	160 71	178 81	232 111	347 175	419 215	487 253	502 261	507 264	235 113		

TABLE 15.—Marketing data and analytical figures for gasolines

MASSACHUSETTS.

Sample No.	City.	Company No.	Sample collected from	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
547	Boston.....	95	G.....	28	25½	0.745	57.9	{ 153 67	108 92	216 102	241 116	262 128
548	do.....	2	D.....	27½	25½	.727	62.8	{ 102 39	135 57	149 65	176 80	198 92
549	do.....	154	F.....	26½	.....	.773	51.1	{ 154 68	174 79	183 84	194 90	203 95
550	do.....	154	F.....	26½	.....	.766	52.8	{ 151 66	176 80	185 85	198 92	208 98
551	do.....	4	F.....	26½	25½	.755	55.4	{ 118 48	165 74	185 85	214 101	232 111
552	do.....	5	F.....	28	25½	.747	57.4	{ 122 50	160 71	181 83	210 99	234 112
553	do.....	1	F.....	27½	.....	.751	56.4	{ 104 40	133 56	147 64	176 80	198 92
554	do.....	21	D.....	.....	25½	.744	58.2	{ 124 51	160 71	180 82	216 102	237 114
555	do.....	238	G.....	26½	24½	.747	57.4	{ 163 73	203 95	221 105	244 118	262 128
556	Springfield.....	2	G.....	28	25½	.724	63.4	{ 108 42	129 54	140 60	169 76	198 92
557	do.....	4	D.....	.....	25½	.758	54.7	{ 144 62	180 82	198 92	217 103	239 115
558	do.....	4	F.....	28	25½	.759	54.5	{ 113 45	176 80	196 91	221 105	239 115
559	do.....	5	G.....	28	25½	.740	59.2	{ 136 58	172 78	189 87	216 102	235 113
560	do.....	1	F.....	28	25½	.753	55.9	{ 127 53	165 74	183 84	210 99	232 111
561	Worcester.....	2	D.....	29	.....	.745	57.9	{ 108 42	138 59	158 70	181 83	201 94
562	do.....	255	D.....	28½	.....	.749	56.9	{ 129 54	169 75	185 85	210 99	230 110
563	do.....	255	D.....	33½	.....	.720	64.4	{ 127 53	144 62	162 72	172 78	181 83
564	do.....	1	D.....	29		.762	53.7	{ 117 47	149 65	167 75	190 88	212 100
565	do.....	5	D.....	29		.754	55.7	{ 133 56	172 78	189 87	207 97	223 106

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566	Calumet.....	3	F.....	24.3	23.9	0.756	55.3	{ 124 51	171 77	194 90	225 107	250 121
567	Detroit.....	141	W.....	25		.750	56.7	{ 108 42	189 87	203 95	225 107	244 118
568	do.....	141	W.....	35	.....	.736	60.2	{ 100 38	135 57	154 68	178 92	237 114
569	do.....	142	F.....	23.7	.....	.742	58.7	{ 93 34	129 64	149 65	185 85	214 101

collected in the 1919 survey, arranged by States—Continued.

MASSACHUSETTS.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
279 137	284 140	293 145	313 156	327 164	343 173	357 186	396 202	410 210	417 214	291 144	1.4	547
212 100	225 107	232 111	257 125	286 141	316 158	370 188	.....	.....	414 212	246 119	4.5	548
216 102	221 105	232 111	244 118	277 136	302 150	324 168	374 190	388 198	399 204	248 120	1.5	549
223 106	230 110	239 115	248 120	271 133	306 152	342 172	374 190	388 198	401 205	252 122	1.5	550
250 121	259 126	244 118	289 143	311 155	334 168	372 189	417 214	.....	424 218	270 132	2.8	551
248 120	257 125	254 129	275 135	295 146	318 159	351 177	388 198	401 205	406 208	264 129	2.0	552
221 105	230 110	243 117	268 131	298 148	324 162	365 185	.....	.....	408 209	250 121	4.4	553
253 123	261 127	270 132	284 140	304 151	324 162	352 178	387 197	399 204	399 204	268 131	2.0	554
277 136	286 141	293 145	311 155	329 165	349 176	381 194	421 216	439 226	450 232	298 148	1.5	555
225 107	235 113	248 120	268 131	295 146	329 165	378 192	410 210	.....	415 213	252 122	3.5	556
259 126	266 130	275 133	293 145	316 158	336 169	370 188	408 209	424 218	432 222	280 138	1.5	557
259 126	270 132	277 136	295 146	316 158	333 167	379 193	423 217	435 224	442 228	279 137	1.5	558
253 123	261 127	268 131	284 140	304 151	313 156	356 180	388 198	401 205	410 210	270 132	1.5	559
248 120	261 127	271 133	288 142	306 152	329 165	360 182	392 200	410 210	414 212	270 132	1.8	560
221 105	232 111	241 116	266 130	291 144	320 160	372 189	.....	.....	426 219	253 123	4.5	561
244 118	234 112	259 126	273 134	291 144	311 155	347 175	388 198	.....	403 206	232 128	2.6	562
192 89	196 91	199 93	212 100	223 106	237 114	262 128	286 141	298 148	320 160	208 98	1.0	563
230 110	237 114	253 123	270 132	295 146	329 165	370 188	417 214	.....	421 216	259 126	2.9	564
237 114	246 119	257 125	277 136	302 150	324 162	356 180	396 202	410 210	417 214	266 130	1.3	565

MICHIGAN.

270 132	284 140	291 144	311 155	333 167	354 179	383 195	410 210	419 215	433 223	288 142	1.3	566
262 128	271 133	279 137	300 149	322 161	347 175	383 195	421 216	433 223	451 233	234 140	.7	567
273 134	288 142	297 147	319 154	331 166	352 178	387 197	439 226	.....	439 226	280 138	3.1	568
237 114	250 121	262 128	291 144	318 159	345 174	383 195	419 215	433 223	435 224	264 129	1.7	569

TABLE 15.—Marketing data and analytical figures for gasolines

MICHIGAN—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
570	Detroit.....	6	D.....	25.7	23.7	0.754	55.7	{ 127 53	171 77	190 88	217 103	239 115
571	do.....	4	G.....	23.7	22.7	.750	56.7	{ 126 52	167 75	183 84	207 97	226 108
572	do.....	4	D.....	23.7	.....	.752	56.2	{ 131 55	180 82	198 92	223 106	243 117
573	do.....	4	D.....	23.7	.....	.752	56.2	{ 129 54	172 78	192 89	217 103	237 114
574	do.....	3	D.....	23.7	.....	.755	55.4	{ 95 35	127 53	149 65	185 85	221 105
575	do.....	3	D.....	29.7	.....	.725	63.1	{ 93 34	117 47	141 55	153 67	176 80
576	do.....	77	D.....	23.7	.....	.746	57.7	{ 104 40	169 76	187 86	212 100	235 113
577	do.....	246	F.....	23.7	.....	.750	56.7	{ 122 50	163 73	183 84	205 96	223 106
578	do.....	246	F.....	25.7	.....	.734	60.7	{ 100 38	142 61	158 70	187 86	208 98
579	Grand Rapids.....	139	F.....	35	.....	.715	65.8	{ 118 48	149 65	160 71	174 79	185 85
580	do.....	139	F.....	23.7	.....	.753	55.9	{ 144 62	189 87	203 95	223 106	232 111
581	do.....	141	F.....	23.7	.....	.799	45.2	{ 165 74	178 81	183 84	190 88	194 90
582	do.....	3	F.....	23.7	.....	.755	55.4	{ 93 34	126 52	147 64	190 88	235 113
583	do.....	3	F.....	29.7	.....	.732	61.3	{ 95 35	122 50	136 58	162 72	190 88
584	do.....	77	G.....	28	23.7	.733	61.0	{ 108 42	145 63	165 74	189 87	207 97
585	Houghton.....	3	G.....	26	23.9	.756	55.3	{ 129 54	163 73	190 88	216 102	250 121
586	do.....	3	G.....	28	23.9	.755	55.4	{ 127 53	165 74	185 85	221 105	250 121
587	do.....	3	G.....	23.9	23.9	.758	54.8	{ 127 53	165 74	187 86	217 103	244 118
588	Lansing.....	67	F.....	23.7	.....	.740	59.2	{ 115 46	154 68	172 78	201 94	223 106
589	do.....	207	F.....	24	.....	.736	60.2	{ 136 58	174 79	187 86	203 95	217 103
590	do.....	3	D.....	23.7	.....	.752	56.2	{ 169 43	151 66	176 80	217 103	246 119
591	do.....	82	F.....	23.7	.....	.735	60.5	{ 133 57	178 81	189 87	203 95	217 103

collected in the 1919 survey, arranged by States—Continued.

MICHIGAN—Continued

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
262 128	275 135	286 141	307 153	334 168	367 186	415 213	460 238	473 245	473 245	293 145	1.3	570
248 120	261 127	271 133	286 141	318 159	345 174	390 199	432 222	442 228	450 232	277 136	1.1	571
259 126	270 132	282 139	302 150	320 160	347 175	387 197	426 219	441 227	459 237	286 141	.9	572
255 124	266 130	277 136	295 146	318 159	345 174	387 197	426 219	444 229	457 236	282 139	.7	573
252 122	270 132	284 140	316 158	343 173	370 188	405 207	430 221	439 226	441 227	279 137	2.3	574
201 94	214 101	228 109	257 125	297 147	351 177	403 206	.....	.....	426 219	246 119	4.2	575
255 124	264 129	273 134	297 147	316 158	338 170	356 180	405 207	415 213	430 221	273 134	1.0	576
235 113	255 124	264 129	282 139	306 152	327 164	365 185	397 203	408 209	423 217	266 130	1.0	577
228 109	234 112	248 120	266 130	291 144	316 158	342 172	385 196	401 205	401 205	250 121	1.7	578
196 91	201 94	207 97	219 104	234 112	255 124	291 144	327 164	349 176	383 195	221 105	.7	579
237 114	268 131	280 138	298 148	322 161	349 176	390 199	428 220	439 226	460 238	286 141	.7	580
01 94	207 97	214 101	232 111	293 145	325 163	369 187	406 208	417 214	441 227	255 124	1.0	581
273 134	288 142	309 154	343 173	369 187	392 200	423 217	.....	.....	451 233	293 145	3.2	582
214 101	228 109	243 117	280 138	318 159	361 183	410 210	.....	.....	441 227	259 126	3.2	583
223 106	230 110	239 115	257 125	277 136	302 150	336 169	372 189	383 195	397 203	246 119	1.2	584
273 134	284 140	297 147	315 157	329 165	354 179	387 197	415 213	426 219	433 223	288 142	2.0	585
275 135	284 140	298 148	318 159	334 168	356 180	388 198	421 216	428 220	433 223	289 143	1.8	586
271 133	284 140	293 145	311 155	329 165	349 176	392 200	412 211	421 216	433 223	288 142	1.2	587
241 116	252 122	261 127	280 138	300 149	324 162	356 180	392 200	405 207	414 212	262 128	1.1	588
232 111	239 115	244 118	262 128	280 138	306 152	352 178	415 213	441 227	450 232	261 127	1.1	589
268 131	275 135	288 142	307 153	325 163	347 175	379 193	412 211	426 219	428 220	280 138	1.8	590
230 110	237 114	244 118	257 125	277 136	300 149	338 170	397 203	423 217	448 231	259 126	.9	591

TABLE 15.—Marketing data and analytical figures for gasolines

MINNESOTA.

Sample No.	City.	Company No.	Sample collected from	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Retail.	Tank wagon.	Specific gravity.	Degrees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
592	Duluth.....	170	D.....	20	20	0.692	72.3	{ 97 38	106 41	113 45	124 51	136 58
593	do.....	170	D.....	24	24	.719	64.9	{ 108 42	127 53	140 60	160 71	181 83
594	do.....	170	D.....			.741	59.1	{ 140 60	181 83	198 92	219 104	241 116
595	do.....	192	D.....	34	34	.728	62.5	{ 90 32	122 50	142 61	162 83	228 109
596	do.....	192	D.....	24	24	.744	58.2	{ 100 38	133 56	153 67	189 87	221 105
597	do.....	3	D.....			.754	55.8	{ 106 41	140 60	158 70	196 91	244 118
598	Minneapolis.....	171	F.....	24		.735	60.5	{ 133 56	185 85	203 95	223 103	239 115
599	do.....	171	G.....	28½		.736	60.2	{ 115 46	151 66	167 75	190 88	216 102
600	do.....	73	D.....	24		.757	54.9	{ 118 48	156 69	176 81	205 96	225 107
601	do.....	73	D.....	28½		.761	54.0	{ 127 53	165 74	178 81	198 92	217 103
602	do.....	73	D.....	26½		.747	57.4	{ 126 52	158 70	169 76	181 83	194 90
603	do.....	3	F.....	24		.759	54.6	{ 111 44	140 60	158 70	192 83	234 112
604	do.....	3	F.....	24		.743	58.4	{ 108 42	142 61	167 75	203 85	228 109
605	do.....	241	F.....	26½		.738	59.7	{ 109 43	142 61	158 70	190 88	212 100
606	do.....	241	F.....	31		.738	59.7	{ 88 31	129 54	149 65	187 86	230 110

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607	Jackson.....	2	D.....	25	23	0.739	59.4	{ 111 44	140 60	158 70	183 84	205 96
608	do.....	12	F.....	25		.741	58.9	{ 109 43	156 69	178 81	212 100	239 115
609	do.....	12	D.....	25	23	.743	58.4	{ 131 55	174 79	194 90	221 105	235 113
610	do.....	1	F.....	25	23	.746	57.7	{ 108 42	158 70	178 81	212 100	235 113
611	do.....	8	D.....		26	.745	57.9	{ 129 54	163 73	178 81	199 93	214 101
612	do.....	1	D.....	25	23	.743	58.4	{ 113 45	154 68	176 80	214 101	235 113

collected in the 1919 survey, arranged by States—Continued.

MINNESOTA.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
4 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
151 66	156 60	165 74	180 82	198 92	223 106	295 146	.....	.....	311 155	181 83	5.7	592
205 96	216 102	226 108	244 118	271 133	300 149	342 172	388 198	.....	388 198	235 113	3.0	593
255 124	262 128	270 132	284 140	304 151	322 161	352 178	.....	397 203	397 203	271 133	1.6	594
266 130	279 137	288 142	307 153	329 165	361 183	.....	.....	.....	399 209	261 127	5.0	595
248 120	257 125	277 136	302 150	329 165	369 187	415 213	423 217	.....	423 217	275 135	3.0	596
270 132	280 138	291 144	309 154	333 167	354 179	396 202	.....	.....	406 208	271 133	3.7	597
253 123	264 129	275 135	291 144	311 155	333 167	367 186	401 205	412 211	432 222	279 137	.8	598
234 112	244 118	265 124	270 132	302 150	333 167	378 192	432 222	439 226	442 228	264 129	2.7	599
250 121	262 128	275 135	291 144	316 158	338 170	379 193	424 218	433 223	441 227	275 135	2.0	600
241 116	252 122	266 130	295 146	320 160	347 175	381 194	423 217	435 224	441 227	273 134	1.9	601
208 98	217 103	226 108	248 126	270 132	298 148	347 175	372 189	392 200	408 209	243 117	1.2	602
264 129	286 141	298 148	327 164	358 181	383 195	415 213	442 228	444 229	444 229	289 143	2.6	603
253 123	264 129	282 139	309 154	334 168	361 183	401 205	437 225	.....	437 225	280 138	3.5	604
235 113	244 118	259 126	282 139	306 152	333 167	374 190	415 213	430 221	433 223	262 128	2.3	605
252 122	271 133	284 140	307 153	327 164	345 174	387 197			421 216	271 133	4.8	606

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221 105	230 110	261 114	280 127	306 138	347 152	403 175	414 206	414 212	414 212	248 120	2.5	607
261 127	270 132	277 136	300 149	320 160	342 172	376 191	419 215	430 221	432 222	277 136	2.4	608
253 123	259 126	270 132	288 142	302 150	324 162	354 179	388 198	401 205	412 211	273 134	1.5	609
253 123	262 128	270 132	288 142	307 153	327 164	361 183	414 212	430 221	430 221	270 132	2.6	610
230 110	235 114	243 117	257 125	271 133	297 147	324 162	354 179	369 187	381 194	248 120	1.4	611
252 122	261 127	270 132	288 142	306 152	327 164	363 184	417 214	433 223	433 223	271 133	2.8	612

TABLE 15.—Marketing data and analytical figures for gasolines

MISSOURI.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De- grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
613	Columbia.....	48	D.....	26	24	0.744	58.2	{ 142 61	181 83	194 90	217 103	234 112
614	do.....	9	F.....	26	23	.747	57.4	{ 135 55	153 77	185 85	207 97	225 108
615	do.....	9	F.....	26	23	.747	57.4	{ 127 53	174 79	190 88	212 100	230 110
616	do.....	258	F.....	23	21	.750	56.7	{ 142 62	189 87	199 93	221 105	239 115
617	do.....	3	F.....	23	23	.747	57.4	{ 100 38	133 56	153 57	199 93	237 114
618	Kansas City.....	52	F.....	22.3	21.3	.746	57.8	{ 138 59	160 71	185 85	212 100	230 110
619	do.....	52	F.....	22.3	21.3	.744	58.2	{ 131 55	167 75	181 83	208 98	230 110
620	do.....	53	F.....	25	23	.746	57.8	{ 169 76	198 92	207 97	217 103	226 108
621	do.....	59	F.....	22.3	22.3	.745	57.9	{ 115 46	169 76	194 90	225 107	248 120
622	do.....	59	F.....	22.3	22.3	.745	57.9	{ 151 66	187 86	201 94	225 107	241 116
623	do.....	63	F.....	25.3	25.3	.737	60.0	{ 140 60	172 78	185 85	198 92	210 90
624	do.....	63	F.....	22.3	22.3	.751	56.4	{ 149 65	181 83	194 90	210 99	226 108
625	do.....	8	F.....	25½	24½	.748	57.2	{ 145 63	185 85	196 91	214 101	228 109
626	do.....	4	F.....	22.3	21.3	.749	56.9	{ 149 65	178 81	190 88	212 100	228 109
627	do.....	3	F.....	22.3	22.3	.747	57.4	{ 109 43	165 74	190 88	217 103	232 111
628	do.....	233	G.....	25	22.3	.751	56.4	{ 136 58	172 78	190 88	214 101	235 113
629	do.....	181	F.....	22.3	21.3	.747	57.4	{ 102 39	136 58	152 67	208 98	243 117
630	St Joseph.....	115	D.....	27	25	.745	57.9	{ 127 53	163 73	181 83	201 94	221 105
631	do.....	115	F.....	22.7	20.7	.748	57.2	{ 129 54	163 73	180 82	210 94	221 105
632	do.....	151	F.....	27	25	.744	58.2	{ 135 57	181 83	198 92	221 105	239 115
633	do.....	3	F.....	22.7	22.7	.743	58.4	{ 109 38	135 57	156 69	163 73	230 110
634	do.....	214	F.....	27	24	.738	59.7	{ 135 57	167 75	180 82	198 92	214 101
635	do.....	214	F.....	22.7	20.7	.751	56.4	{ 144 62	181 83	198 92	219 104	239 115
636	do.....	85	F.....	22.7	22.7	.745	57.9	{ 119 65	178 81	190 88	207 97	223 105
637	do.....	85	F.....	27	27	.726	62.8	{ 129 54	158 70	167 75	180 82	190 88

collected in the 1919 survey, arranged by States—Continued.

MISSOURI.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
246 119	253 123	262 127	272 132	297 147	325 163	365 185	406 208	414 212	435 224	271 133	2.0	613
239 115	250 121	259 126	279 137	300 145	325 163	387 197	410 210	439 226	444 229	264 129		
248 120	257 125	268 131	286 141	307 153	338 170	378 192	423 217	439 226	448 231	275 135	1.8	615
253 123	262 128	270 132	289 143	309 154	322 161	369 187	417 214	437 225	466 241	280 138	.6	616
268 131	279 137	295 146	324 162	354 179	387 197	439 226	480 249	480 249	480 249	295 146	3.5	617
248 120	261 127	268 131	291 144	333 156	340 171	379 193	417 211	428 220	433 223	277 136	1.7	618
248 120	261 127	270 132	291 144	315 157	340 171	378 192	410 210	415 213	417 214	273 134	1.6	619
243 117	248 120	255 124	268 131	292 139	302 150	334 168	361 183	370 188	388 198	262 128	.6	620
261 127	279 137	286 141	309 154	333 167	354 179	390 199	417 214	421 216	424 218	286 141	1.7	621
257 125	264 129	273 134	291 144	309 154	327 164	356 180	385 196	396 202	417 214	277 136	.8	622
223 106	228 109	235 113	253 123	275 135	300 149	329 165	356 180	367 186	390 199	250 121	1.1	623
244 118	253 123	266 130	288 142	311 155	334 168	365 185	396 202	405 207	428 219	273 134	.8	624
243 117	248 120	255 124	270 132	286 141	307 153	333 167	365 185	376 191	397 203	261 127	.7	625
248 120	261 127	270 132	293 145	315 157	342 172	381 194	419 215	428 220	430 221	279 137	1.0	626
266 130	273 134	286 141	311 155	331 166	356 180	385 198	421 216	430 221	439 226	284 140	1.5	627
248 120	268 131	280 138	306 152	331 166	347 175	392 200	428 220	437 225	451 233	284 140	.9	628
273 134	286 141	298 148	327 164	356 180	388 198	439 226	.....	.....	468 242	297 147	3.6	629
239 115	250 121	255 124	286 141	313 156	340 171	379 193	417 214	432 222	437 225	271 133	1.2	630
241 116	252 122	266 130	288 142	316 158	351 177	396 202	444 229	457 236	457 236	277 136	1.7	631
255 124	264 129	255 124	293 145	309 154	329 165	360 182	390 199	401 205	405 207	273 134	1.7	632
257 125	264 128	282 139	309 154	345 174	381 194	423 223	464 240	.....	464 240	284 140	5.5	633
230 110	237 114	244 118	261 127	279 137	311 155	356 180	408 209	417 214	417 214	257 125	1.1	634
244 118	248 131	282 139	306 152	338 170	372 189	424 218	469 243	478 248	478 248	295 146	1.2	635
239 115	246 119	253 123	266 130	298 148	320 160	343 173	381 194	394 201	405 207	262 128	1.7	636
201 94	208 98	214 101	226 108	243 117	264 129	302 150	336 169	349 176	370 188	226 108	1.3	637

TABLE 15.—*Marketing data and analytical figures for gasolines*

MISSOURI—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
638	St. Louis.....	99	F.....	25½	24.4	0.742	58.7	{ 97 35	131 55	151 68	194 90	230 110
639	do.....	99	D.....	27	25.9	.735	60.5	{ 90 32	124 51	145 63	183 84	216 102
640	do.....	99	D.....	22.4	22.4	.741	58.2	{ 106 41	131 55	151 66	94 90	225 107
641	do.....	9	F.....	22.4	.....	.741	58.9	{ 145 63	180 82	194 90	210 99	225 107
642	do.....	9	F.....	22.4	.....	.742	58.7	{ 147 64	180 82	154 90	210 99	226 108
643	do.....	221	G.....	25½	.....	.739	59.4	{ 91 33	126 52	149 65	187 86	216 102
644	do.....	221	G.....	22.4	.....	.752	56.2	{ 172 78	205 96	217 103	228 109	239 115
645	do.....	3	F.....	23	22.4	.748	57.2	{ 97 36	133 56	154 68	194 90	230 110
646	do.....	3	F.....	23	22.4	.749	56.9	{ 99 37	136 58	145 70	196 91	232 111
647	do.....	215	F.....	25.2	.....	.741	58.9	{ 145 63	178 81	192 89	207 97	223 106
648	do.....	215	F.....	22.4	.....	.756	55.2	{ 167 75	205 96	219 104	235 113	250 121
649	do.....	1	F.....	22.4	.....	.745	57.9	{ 158 70	185 85	196 91	208 98	219 104
650	do.....	1	F.....	22.4	.....	.745	57.9	{ 131 55	178 81	182 89	210 90	223 106

MONTANA.

651	Bozeman.....	10	F.....	27½	.....	0.770	51.9	{ 118 48	154 68	171 77	199 93	226 108
652	do.....	10	G.....	30	.....	.773	51.1	{ 135 57	165 74	178 81	203 95	228 109
653	do.....	59	F.....	28	.....	.751	56.4	{ 133 56	187 86	203 95	226 108	244 118
654	do.....	60	D.....	28	.....	.763	53.6	{ 122 50	162 72	178 81	201 94	230 110
655	do.....	73	G.....	30	.....	.756	55.2	{ 127 53	171 77	194 90	221 105	243 117
656	do.....	1	F.....	27½	.....	.759	54.6	{ 140 60	167 75	181 83	203 95	225 107
657	Missoula.....	10	D.....	29	28	.752	56.2	{ 138 59	171 77	185 85	205 96	226 108
658	do.....	183	D.....	30	28	.751	56.4	{ 183 84	210 99	225 107	241 116	253 123
659	do.....	185	D.....	.....	28	.752	56.2	{ 135 57	167 75	180 82	207 97	225 107

collected in the 1919 survey, arranged by States—Continued.

MISSOURI—Continued.

Distillation—Continued											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
265 130	277 136	289 143	316 158	340 171	365 185	406 208	..... .....	..... .....	453 234	282 139	4.4	638
244 118	254 126	273 134	302 150	329 165	356 180	403 206	..... .....	..... .....	437 225	271 133		
252 122	266 130	284 140	306 152	331 166	358 181	396 202	433 223	..... .....	439 226	277 136	3.2	640
234 112	241 116	250 121	266 130	284 140	306 152	340 171	376 191	387 197	415 213	261 127		
237 114	244 118	252 122	268 131	286 141	309 154	343 172	381 194	392 200	417 214	262 128	.6	642
243 117	252 122	262 128	291 144	316 158	347 175	392 200	437 225	..... .....	441 227	266 130		
253 123	262 128	270 132	284 140	304 151	325 163	356 180	388 198	399 204	432 222	280 138	.5	644
261 127	275 135	289 143	318 159	336 169	376 191	417 214	448 231	455 235	457 236	284 140		
264 129	277 136	289 142	325 162	354 179	383 195	421 216	455 235	..... .....	457 236	289 143	3.7	646
237 114	246 119	253 123	270 132	293 145	316 158	352 178	396 202	414 212	428 220	266 130		
266 130	275 135	282 139	302 150	322 161	342 172	376 191	414 212	426 219	446 230	291 144	1.0	648
232 111	239 115	248 120	262 128	277 136	295 146	324 162	356 180	365 185	378 192	253 123		
224 112	241 116	248 120	262 128	280 138	302 150	324 168	365 185	378 192	387 197	255 124	1.9	650

MONTANA.

252 122	264 129	279 137	309 154	343 173	381 194	428 220	466 241	480 249	480 249	289 143	2.1	651
250 121	266 130	282 139	306 152	342 172	379 193	423 217	442 228	464 240	478 248	291 144		
259 126	268 131	275 135	293 145	311 155	333 167	365 185	401 205	412 211	419 215	279 137	1.7	653
253 123	259 126	266 130	311 155	379 193	424 218	437 225	460 238	473 245	482 250	298 148		
261 127	273 134	284 140	302 150	324 162	347 175	378 192	428 220	435 224	435 224	304 151	2.6	655
248 120	257 125	264 129	291 144	316 158	351 177	401 205	437 225	446 230	450 232	279 137		
248 120	259 126	270 132	293 145	325 163	358 181	405 207	444 229	457 236	473 245	284 140	1.2	657
264 129	279 137	286 141	298 148	315 157	336 169	361 183	406 208	419 215	428 220	289 143		
239 115	248 120	255 124	271 133	291 144	318 159	363 184	405 207	424 218	441 227	266 130	1.3	659

TABLE 15.—Marketing data and analytical figures for gasolines

NEBRASKA.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
660	Lincoln	151	F.	24		0.748	57.2	{ 109 43	145 63	163 73	201 94	232 111
661	do.	174	G.	26		.754	55.7	{ 99 37	181 83	201 94	226 108	243 117
662	do.	23	F.	24		.751	56.4	{ 99 37	124 51	144 62	180 82	217 103
663	do.	227	F.	24		.746	57.7	{ 100 38	153 67	172 78	204 94	226 108
664	Omaha	34	F.	27		.744	58.2	{ 133 56	167 75	181 83	196 91	212 100
665	do.	170	F.	27		.739	59.4	{ 104 40	151 66	169 76	189 87	210 99
666	do.	170	F.	24		.744	58.2	{ 93 34	131 55	153 67	187 86	217 103
667	do.	8	D.	27		.750	56.7	{ 135 57	171 77	183 84	199 93	217 103
668	do.	8	G.	27		.749	56.9	{ 145 63	183 84	196 91	214 101	226 108
669	do.	191	F.	24		.743	58.4	{ 131 55	160 71	183 84	203 95	221 105
670	do.	191	F.	27		.738	59.7	{ 122 50	156 69	172 78	194 80	212 100
671	do.	4	G.	26		.748	57.2	{ 144 62	178 81	187 86	212 100	228 109
672	do.	23	F.	24		.753	55.9	{ 99 37	140 60	165 74	207 97	250 121

NEW HAMPSHIRE.

673	Concord	2	S.	29	25.5	0.729	62.0	{ 106 41	131 55	149 65	178 81	205 96
673-A	do.	5	G.	29	25.5	.738	59.7	{ 127 53	167 75	189 87	214 101	232 111
674	Manchester	2	G.	30	25.5	.730	61.8	{ 102 39	138 59	158 70	198 92	226 108
675	do.	5	G.	27	25.5	.739	59.4	{ 126 52	163 73	183 84	210 99	232 111
676	do.	5	G.	28	25.5	.740	59.2	{ 127 53	165 74	183 84	210 99	228 109
677	do.	1	G.	29	25.5	.746	57.7	{ 102 39	133 56	153 67	180 82	203 95
678	Portsmouth	5	G.	30	25.5	.741	58.9	{ 133 56	171 77	190 88	216 102	235 113
678-A	do.	5	G.	30	25.5	.740	59.2	{ 131 55	171 77	189 87	212 100	230 110

collected in the 1919 survey, arranged by States—Continued.

NEBRASKA.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
259 126	268 131	282 139	304 151	325 163	347 175	392 200	432 222	444 229	451 233	279 137	1.6	660
259 126	268 131	279 237	298 148	316 158	340 171	374 190	406 208	415 213	442 228	280 138		
150 121	266 130	280 138	311 155	336 169	367 186	406 208	426 219	.....	430 221	275 135	2.4	662
248 120	257 125	266 130	293 145	316 168	342 172	374 190	408 209	417 214	430 221	270 132		
226 108	234 112	243 117	261 127	282 139	307 153	334 168	361 183	372 189	388 198	252 122	.8	664
232 111	243 117	253 123	280 138	309 154	343 173	401 205	460 238	.....	469 243	270 132		
246 119	262 128	275 135	304 151	331 166	361 183	419 215	453 234	.....	453 234	277 136	2.2	666
234 112	239 115	250 121	268 131	285 141	304 151	334 168	365 185	379 193	396 202	255 124		
243 117	250 121	257 125	273 134	291 144	311 155	343 173	376 191	388 198	403 206	264 129	1.6	668
237 114	237 114	255 124	275 135	295 146	325 163	370 188	415 213	430 221	433 223	266 130		
230 110	237 114	246 119	262 128	284 140	311 155	351 177	390 199	406 208	421 216	255 124	1.8	670
243 117	255 124	268 131	288 142	311 155	338 170	378 192	414 212	423 217	426 219	275 135		
254 140	295 146	307 153	334 168	360 182	385 196	430 221	.....	.....	457 236	298 148	4.1	672

NEW HAMPSHIRE.

230 110	239 115	252 122	282 139	307 153	333 167	376 191	421 216	.....	428 220	259 126	3.0	673
248 120	257 125	264 129	282 139	298 148	320 160	352 178	387 197	397 203	405 207	266 130		
246 119	253 123	266 130	289 143	313 156	338 170	387 197	.....	.....	433 223	270 132	4.2	674
246 119	255 124	264 129	279 137	300 149	322 161	354 179	387 197	399 204	406 208	266 130		
244 118	257 125	266 130	282 139	298 148	324 162	354 179	388 198	399 204	403 206	266 130	2.0	676
223 106	235 113	239 115	257 125	289 143	320 160	356 180	392 200	.....	399 204	248 120		
250 121	257 125	264 129	279 137	298 148	322 161	356 180	388 198	396 202	415 213	271 133	1.0	678
248 120	255 124	264 129	280 138	293 145	320 160	351 177	383 195	392 200	410 210	266 130		

TABLE 15.—Marketing data and analytical figures for gasolines

NEW JERSEY.

Sample No	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
679	Camden.....	11	F.....	26	.....	0.737	60.0	{ 140 60	169 76	181 83	201 94	219 104
680	do.....	2	S.....	24	22½	.740	59.2	{ 118 48	147 64	162 72	189 89	210 99
681	do.....	7	S.....	24	22½	.751	56.4	{ 115 46	145 63	165 74	199 93	228 109
682	do.....	1	S.....	25	22½	.743	58.4	{ 106 41	149 65	169 76	201 94	226 108
683	Jersey City.....	2	G.....	25	22½	.738	59.7	{ 122 50	147 64	162 72	187 86	208 98
684	do.....	7	S.....	25	22½	.749	56.9	{ 147 64	180 82	194 90	210 99	228 109
685	do.....	1	F.....	24.5	22½	.749	56.9	{ 122 50	149 65	162 72	181 83	198 92
686	Newark.....	11	F.....	26	.....	.730	61.8	{ 131 55	172 78	185 85	203 95	216 102
687	do.....	2	S.....	25	22½	.738	59.7	{ 111 44	154 68	172 78	199 93	223 106
688	do.....	251	F.....	26	23½	.852	34.3	{ 169 76	181 83	185 85	189 87	192 89
689	do.....	7	F.....	25	22½	.750	56.7	{ 138 59	176 80	192 89	217 103	237 114
690	do.....	1	F.....	24.5	22½	.752	56.2	{ 113 45	142 61	156 69	178 81	198 92
691	do.....	20	F.....	25	.....	.744	58.2	{ 167 75	203 95	216 102	230 110	244 118
692	Trenton.....	2	S.....	24	22½	.737	60.0	{ 118 48	149 65	165 74	192 89	216 102
693	do.....	7	G.....	25	22½	.748	57.2	{ 111 44	142 61	162 72	196 91	225 107
694	do.....	1	S.....	25	22½	.754	55.7	{ 111 44	140 60	156 69	185 85	208 98

NEW MEXICO.

695	Albuquerque.....	10	F.....	32	27½	0.749	56.9	{ 113 45	165 74	185 85	216 102	239 115
696	do.....	4	F.....	32	27½	.750	56.7	{ 145 63	176 80	192 89	217 103	245 113
697	do.....	1	X.....	30	27½	.757	54.9	{ 115 46	147 64	199 73	219 104	230 110
698	do.....	1	G.....	32	27½	.750	56.7	{ 122 50	181 83	205 96	223 106	237 114

NEW YORK.

699	Albany.....	4	S.....	28	25½	0.758	54.7	{ 144 62	183 84	196 91	217 103	237 114
700	do.....	5	G.....	27	25½	.750	56.7	{ 138 59	172 75	185 85	210 99	230 110

collected in the 1919 survey, arranged by States—Continued.

NEW JERSEY.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
234 112	241 116	250 121	264 129	286 141	309 154	349 176	394 201	410 210	435 224	261 127	1.2	679
228 109	239 115	248 120	264 129	291 144	316 158	356 180	399 204	421 216	426 219	255 124	2.0	680
253 123	266 130	275 135	297 147	315 157	343 173	381 194	432 222	.....	441 227	273 134	3.0	681
246 119	255 134	266 130	284 140	300 149	329 165	360 182	399 204	417 214	430 221	264 129	2.2	682
228 109	237 114	248 120	268 131	288 142	315 157	356 180	396 202	406 208	410 210	253 123	2.0	683
246 119	255 124	264 129	280 138	297 147	311 155	352 178	383 195	396 202	415 213	268 131	1.2	684
216 102	225 107	235 113	261 127	280 138	318 159	356 180	379 193	401 205	417 214	241 115	1.4	685
226 108	232 111	239 115	250 121	270 132	295 145	342 172	392 200	421 216	428 220	253 123	1.8	686
239 115	248 120	257 125	277 136	297 147	322 161	365 185	415 213	.....	428 220	262 128	2.4	687
196 91	198 92	201 94	207 97	214 101	226 108	248 120	320 160	347 175	358 181	217 103	1.2	688
257 125	264 129	275 135	293 145	307 153	327 164	363 184	399 204	412 211	415 213	275 135	2.0	689
214 101	223 106	234 112	259 126	286 141	318 159	360 182	406 208	.....	419 215	248 120	2.9	690
257 125	266 130	277 136	293 145	313 156	338 170	374 190	394 201	406 208	423 217	284 140	.8	691
234 112	244 118	253 123	271 133	295 146	322 161	365 185	415 213	435 224	435 224	261 127	3.0	692
246 119	257 125	273 134	291 144	311 155	333 167	374 190	424 218	.....	435 224	268 131	2.8	693
228 109	239 115	250 121	275 135	300 149	329 165	361 183	418 231	.....	457 236	261 127	3.0	694

NEW MEXICO.

257 125	270 132	279 137	300 149	322 161	347 175	383 195	424 218	441 227	453 234	280 138	1.8	695
253 123	262 128	271 133	289 143	309 154	331 166	365 185	399 204	414 212	424 218	275 135	1.5	696
244 118	252 122	257 125	273 134	288 142	309 154	340 171	385 196	.....	388 198	261 127	2.7	697
250 121	255 124	262 128	277 136	291 144	309 154	338 170	378 192	390 199	399 204	262 128	2.0	698

NEW YORK.

253 123	262 128	273 134	289 143	304 151	322 161	356 180	387 197	403 206	410 210	271 133	1.2	699
248 120	255 124	270 132	291 144	311 155	336 169	372 189	396 202	417 214	433 223	275 135	1.5	700

TABLE 15.—Marketing data and analytical figures for gasolines

NEW YORK—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
701	Albany.....	1	S.....	28	25½	0.750	56.7	{ 120 49	{ 149 65	{ 163 73	{ 189 87	{ 207 97
702	do.....	243	F.....	27	25½	.735	60.5	{ 102 39	{ 133 56	{ 153 67	{ 196 91	{ 232 111
703	do.....	243	F.....	27	25½	.760	60.5	{ 111 44	{ 144 62	{ 165 74	{ 203 95	{ 237 114
704	Brooklyn.....	11	G.....	29	24½	.739	59.4	{ 151 66	{ 185 85	{ 196 91	{ 214 101	{ 223 109
705	do.....	2	G.....	28	24½	.739	59.4	{ 127 53	{ 167 75	{ 185 85	{ 210 99	{ 230 110
706	do.....	20	G.....	28	24½	.742	58.7	{ 151 66	{ 190 88	{ 208 98	{ 225 107	{ 237 114
707	do.....	5	F.....	28	24½	.742	58.7	{ 127 53	{ 178 81	{ 196 91	{ 219 104	{ 234 112
708	do.....	1	F.....	27		.749	56.9	{ 109 43	{ 145 63	{ 158 70	{ 181 83	{ 199 93
709	Buffalo.....	107	F.....	26		.733	61.0	{ 91 33	{ 135 57	{ 163 73	{ 210 99	{ 248 120
710	do.....	144	G.....	28		.805	43.9	{ 153 67	{ 174 79	{ 180 82	{ 187 86	{ 190 88
711	do.....	144	G.....	26		.806	43.7	{ 158 70	{ 178 81	{ 183 84	{ 190 88	{ 198 92
712	do.....	144	F.....	26		.806	43.7	{ 160 71	{ 176 80	{ 180 82	{ 194 90	{ 203 95
713	do.....	156	G.....	26		.730	61.8	{ 95 35	{ 121 55	{ 158 70	{ 194 90	{ 228 109
714	do.....	196	F.....	30		.725	63.1	{ 155 57	{ 167 75	{ 180 82	{ 196 91	{ 208 98
715	do.....	196	F.....	26		.742	58.7	{ 131 55	{ 172 78	{ 189 87	{ 207 97	{ 219 104
716	do.....	4	F.....	26		.756	55.2	{ 122 59	{ 163 74	{ 185 85	{ 212 100	{ 232 111
717	do.....	5	F.....	27		.750	56.7	{ 133 56	{ 180 82	{ 199 93	{ 219 104	{ 235 113
718	do.....	5	G.....	27		.749	56.9	{ 140 60	{ 185 85	{ 201 94	{ 221 105	{ 242 117
719	do.....	241	D.....	26	23½	.770	51.8	{ 113 45	{ 163 72	{ 180 82	{ 198 92	{ 216 104
720	do.....	241	D.....	26	23½	.736	60.2	{ 102 59	{ 137 75	{ 161 94	{ 204 115	{ 234 127
721	Ithaca....	164	F., D..	17		.721	64.2	{ 118 48	{ 162 72	{ 183 84	{ 212 100	{ 230 119
722	do.....	5	G.....	29	25½	.735	60.5	{ 118 59	{ 176 80	{ 199 93	{ 214 101	{ 226 108
723	do.....	5	F.....	28	25½	.735	60.5	{ 131 55	{ 175 80	{ 189 87	{ 207 97	{ 221 105
724	do.....	1	G.....	28	25½	.747	57.4	{ 88 31	{ 115 46	{ 131 55	{ 181 83	{ 221 105

collected in the 1919 survey, arranged by States—Continued.

NEW YORK—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point		
228 109	239 115	252 122	271 133	293 145	318 159	352 178	388 198	.....	392 200	253 123	3.3	701
255 124	266 130	275 135	297 147	318 159	338 170	369 187	410 210	.....	412 211	268 131	2.8	702
261 127	270 132	279 137	297 147	315 157	334 168	367 186	403 206	410 210	412 211	271 133	2.4	703
234 112	248 120	257 125	273 134	293 145	324 162	372 189	419 215	421 216	421 216	270 132	2.0	704
248 120	255 124	264 129	284 140	307 153	334 168	376 191	419 215	432 222	439 226	273 134	2.1	705
250 121	257 125	262 128	279 137	293 145	309 154	347 175	378 192	388 198	405 207	270 132	1.3	706
250 121	257 125	266 130	280 138	298 148	320 160	351 177	388 197	403 206	408 209	268 131	1.6	707
217 103	226 108	237 114	257 125	291 144	320 160	360 182	397 203	399 204	399 204	248 120	1.7	708
271 133	282 139	289 143	309 154	329 165	352 178	401 205	.....	.....	419 215	280 138	6.2	709
201 94	207 97	212 100	230 110	262 125	304 151	349 176	385 196	392 203	412 211	244 118	.9	710
205 96	210 99	219 104	237 114	270 132	306 152	347 175	385 196	399 204	415 213	248 120	.7	711
210 99	219 104	226 108	248 120	271 133	302 150	345 174	381 194	399 204	410 210	250 121	1.4	712
252 122	261 127	275 135	300 149	325 163	363 184	417 214	.....	.....	448 231	279 137	5.5	713
221 105	230 110	235 113	250 121	262 128	289 143	315 157	365 185	383 195	383 195	243 117	1.8	714
235 113	243 117	248 120	266 130	284 140	311 155	340 171	369 187	378 192	399 204	257 125	.9	715
252 122	253 123	271 133	293 145	315 157	342 172	378 192	410 210	423 217	432 222	275 135	1.1	716
248 120	262 128	271 133	288 142	306 152	324 162	354 179	383 195	394 201	414 212	271 133	.7	717
255 124	266 130	272 134	289 143	307 153	329 165	361 182	399 204	410 210	412 211	275 135	1.8	718
248 120	257 125	282 139	307 153	327 164	349 176	392 200	.....	.....	428 220	277 136	4.7	719
279 137	289 143	298 148	313 156	333 167	356 180	408 209	.....	.....	432 222	293 145	5.4	720
255 124	262 128	277 136	297 147	318 159	338 170	365 185	397 203	410 210	414 213	273 134	1.6	721
239 115	248 120	253 123	266 130	282 139	302 150	338 170	397 203	430 221	435 224	262 128	1.6	722
230 110	239 115	248 120	262 128	280 138	311 155	365 185	433 223	468 242	484 251	266 130	.9	723
250 121	268 131	277 136	307 153	325 163	352 178	401 205	.....	.....	430 221	270 132	6.8	724

TABLE 15.—Marketing data and analytical figures for gasolines

NEW YORK Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Retail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
725	Ithaca.....	1	F.....	28	25½	0.755	55.4	{ 122 50	{ 163 73	{ 181 83	{ 205 96	{ 223 106
726	New York.....	5	F.....	28	24½	.741	58.9	{ 133 56	{ 178 81	{ 198 92	{ 221 105	{ 235 113
727	do.....	5	F.....	27	.....	.740	59.2	{ 133 56	{ 178 81	{ 194 90	{ 216 102	{ 234 112
728	do.....	1	F.....	27	.....	.753	55.9	{ 115 46	{ 158 70	{ 176 80	{ 198 92	{ 216 102
729	do.....	21	F.....	27	24.5	.736	60.2	{ 117 47	{ 160 71	{ 180 82	{ 207 97	{ 225 107
730	Rochester.....	6	D.....	28	24.5	.749	56.9	{ 117 47	{ 163 73	{ 183 84	{ 212 100	{ 237 114
731	do.....	6	D.....	28	24.5	.750	56.7	{ 115 46	{ 160 71	{ 180 82	{ 208 98	{ 235 113
732	do.....	182	F.....	28	27	.803	44.3	{ 145 63	{ 169 76	{ 174 79	{ 180 82	{ 185 85
733	do.....	182	F.....	28	27	.803	44.3	{ 153 67	{ 172 78	{ 178 81	{ 183 84	{ 187 86
734	do.....	209	G.....	28	.....	.737	60.0	{ 134 68	{ 190 88	{ 203 95	{ 223 106	{ 241 116
735	do.....	212	P.....	25	24½	.845	35.7	{ 172 78	{ 181 83	{ 185 85	{ 190 88	{ 194 90
736	do.....	212	P.....	25	24½	.845	35.7	{ 172 78	{ 181 83	{ 187 86	{ 190 88	{ 194 90
737	do.....	4	D.....	27	.....	.757	54.9	{ 122 50	{ 165 74	{ 185 85	{ 210 99	{ 232 111
738	do.....	5	G.....	24½	23½	.736	60.2	{ 136 58	{ 172 78	{ 187 86	{ 203 95	{ 217 103
739	do.....	5	G.....	24½	23½	.736	60.2	{ 136 58	{ 171 77	{ 185 85	{ 201 94	{ 216 102
740	do.....	5	D.....	28	.....	.750	56.7	{ 138 50	{ 176 80	{ 187 86	{ 205 96	{ 217 103
741	do.....	5	F.....	28	.....	.738	59.7	{ 151 66	{ 185 85	{ 201 94	{ 219 104	{ 234 112
742	Syracuse.....	29	D.....	27	22½	.755	55.4	{ 158 70	{ 196 91	{ 210 99	{ 232 110	{ 246 119
743	do.....	5	G.....	27	25½	.750	56.7	{ 131 55	{ 180 82	{ 196 91	{ 221 105	{ 243 117
744	do.....	179	G.....	28	25½	.750	56.7	{ 122 50	{ 174 79	{ 189 87	{ 212 100	{ 230 110
745	do.....	179	D.....	39	35	.711	66.9	{ 124 51	{ 151 66	{ 160 71	{ 171 77	{ 183 84
746	do.....	253	D.....	27	22½	.805	43.9	{ 167 75	{ 178 81	{ 178 81	{ 187 86	{ 192 89
747	Troy.....	5	G.....	28	25.5	.745	57.9	{ 131 55	{ 171 77	{ 189 87	{ 216 102	{ 235 113
748	do.....	21	F.....	28	.....	.743	58.4	{ 111 44	{ 151 66	{ 172 78	{ 203 95	{ 225 107

collected in the 1919 survey, arranged by States—Continued.

NEW YORK - Continued.

Distillation—Continued.												Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.			
239 115	244 118	259 126	279 137	302 150	327 164	354 179	383 195	397 203	415 213	264 129	0.8	725	
252 122	259 125	268 131	284 140	302 150	324 162	356 180	388 198	399 204	410 210	271 133			
250 121	259 126	266 130	284 140	307 153	327 164	361 183	392 200	406 206	408 209	271 133	1.6	727	
234 112	243 117	253 123	270 132	298 148	324 162	361 183	401 205	412 211	414 212	259 126			
239 115	248 120	255 124	268 131	289 143	311 155	342 172	374 190	387 197	394 201	257 125	1.9	728	
259 126	270 132	280 138	302 150	327 164	356 180	410 210	459 237	.....	460 238	286 141			
257 125	266 130	279 137	304 151	329 165	358 181	410 210	457 236		457 236	284 140	2.6	731	
192 89	198 92	203 95	225 107	261 127	306 152	354 179	401 205	415 213	421 216	241 116			
194 90	198 92	203 95	221 105	250 121	304 151	352 178	403 206	417 214	430 221	241 116	1.3	733	
253 123	266 130	271 133	288 142	304 151	325 163	360 182	388 198	401 205	403 206	275 135			
199 93	203 95	207 97	217 103	234 112	253 123	291 144	333 167	352 178	383 195	230 110	1.0	735	
199 93	203 95	207 97	217 103	234 112	255 124	289 143	331 166	352 178	383 195	230 110			
250 121	262 128	271 133	291 144	316 158	342 172	378 192	421 216	428 220	435 224	275 135	1.8	737	
230 110	239 115	246 119	261 127	279 137	306 152	351 177	403 206	423 217	428 220	259 126			
228 109	235 113	244 118	257 125	275 135	300 149	340 171	392 200	412 212	430 221	255 124	.8	739	
232 111	243 117	250 121	268 131	286 141	311 155	361 183	423 217	435 224	435 224	262 128			
252 122	259 126	268 131	284 140	302 150	322 161	349 176	379 193	392 200	393 203	271 133	1.3	741	
264 129	273 134	282 139	297 147	315 157	336 169	369 187	297 203	410 210	433 223	286 141			
215 124	262 128	275 135	316 146	340 158	374 171	410 190	426 210	435 219	433 223	280 138	1.1	743	
248 120	253 123	262 128	282 139	300 149	325 163	360 182	397 203	412 211	423 217	268 131			
194 90	199 93	203 95	216 102	228 109	246 119	275 135	311 155	331 166	343 173	214 101	2.0	745	
199 93	203 95	210 99	230 110	266 130	306 152	349 176	385 196	401 205	415 213	246 119			
253 123	262 128	268 131	282 139	293 145	316 158	340 171	369 187	378 192	383 195	214 129	2.0	747	
243 117	250 121	261 127	280 138	311 150	329 165	358 181	388 198	396 202	401 205	262 128			

158 QUALITY OF GASOLINE MARKETED IN UNITED STATES.

TABLE 15.—Marketing data and analytical figures for gasoline

NORTH CAROLINA.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
749	Charlotte.....	2	F.....	27	25	0.743	58.2	{ 127 53	163 73	176 80	201 94	219 104
750	do.....	6	D.....	27	25	.740	59.2	{ 127 53	167 75	181 83	201 94	216 102
751	do.....	7	F.....	27	25	.750	56.7	{ 131 55	172 78	205 96	221 105	230 110
752	do.....	1	F.....	27	25	.730	61.8	{ 127 53	162 72	172 78	189 87	203 95
753	Raleigh.....	6	D.....	{ 25 26		.741	58.9	{ 129 54	162 72	180 82	196 91	214 101
754	do.....	7	D.....		25	.747	57.4	{ 133 56	172 78	192 89	219 104	234 112
755	do.....	7	F.....	28	25	.747	57.4	{ 127 53	163 73	189 87	217 103	239 115
756	do.....	1	D.....	{ 25 26		.754	55.7	{ 117 47	151 66	169 76	199 93	221 105
757	do.....	1	F.....			.752	56.2	{ 113 45	147 64	165 74	196 91	219 104
758	Wilmington.....	128	F.....	25	23½	.753	55.9	{ 111 44	151 66	171 79	199 93	219 104
759	do.....	7	D.....	25½	23½	.751	56.4	{ 127 53	172 78	194 90	221 105	241 116
760	do.....	7	F.....	25	23½	.752	56.2	{ 136 58	185 85	205 96	230 110	248 120
761	do.....	1	D.....		23½	.762	53.7	{ 133 56	169 76	185 85	208 98	226 108
762	do.....	1	F.....			.752	56.2	{ 118 48	151 66	169 76	199 93	223 106
763	do.....	1	D.....		23½	.753	55.9	{ 118 48	151 66	172 78	203 95	225 107

NORTH DAKOTA.

764	Fargo.....	148	G.....	30		0.750	56.7	{ 100 38	145 63	171 77	208 98	244 118
765	do.....	174	G.....	30		.750	56.7	{ 149 65	183 84	196 91	217 103	221 105
766	do.....	173	D.....	27		.827	39.3	{ 162 72	172 78	181 83	194 90	219 104
767	do.....	4	D.....	33.1		.732	61.3	{ 149 65	169 76	176 89	189 87	201 94
768	do.....	4	G.....	30		.751	56.5	{ 140 60	180 82	194 90	212 100	234 112
769	do.....	3	F.....	27.1		.757	55.1	{ 109 43	147 64	171 77	210 99	248 120
770	Grand Forks.....	11	F.....	27.3		.751	56.4	{ 147 64	181 83	194 90	217 103	237 114
771	do.....	11	F.....	31.5		.734	60.7	{ 120 49	136 58	151 66	169 76	181 83

collected in the 1919 survey, arranged by States—Continued.

NORTH CAROLINA.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
235 113	244 118	255 124	271 133	293 145	309 154	356 180	392 200	406 206	424 218	261 127	1.8	749
230 110	235 113	243 117	261 127	280 138	306 152	347 175	390 199	415 213	419 215	255 124	1.8	750
266 130	273 131	282 139	298 148	318 159	336 169	372 189	401 205	415 213	423 217	280 138	1.8	751
216 102	223 106	230 110	244 118	261 127	284 140	322 161	367 186	383 195	394 201	241 116	2.0	752
226 108	234 112	241 116	255 124	273 134	298 148	338 170	379 193	392 200	417 214	252 122	1.8	753
259 126	270 132	275 135	295 146	315 157	338 170	369 187	405 207	412 211	426 219	277 136	1.9	754
257 125	266 130	273 134	293 145	315 157	340 171	372 189	410 210	.....	424 218	277 136	2.7	755
243 117	252 122	262 128	284 140	309 154	329 165	360 182	392 200	405 207	417 214	264 129	2.0	756
237 114	246 119	257 125	280 138	300 149	325 163	356 180	388 198	405 207	410 210	261 127	2.8	757
232 111	252 122	262 128	282 139	302 150	327 164	358 181	392 200	406 208	412 211	261 127	1.9	758
257 125	266 130	275 135	291 144	307 153	325 163	361 183	392 200	403 206	419 215	275 135	2.2	759
262 128	270 132	280 138	293 145	313 156	334 168	365 185	399 204	410 210	424 218	280 138	2.0	760
218 120	257 125	266 130	289 143	313 156	334 168	369 187	405 207	417 214	424 218	271 133	2.3	761
234 112	252 122	262 128	282 139	302 150	325 163	358 181	394 201	408 209	412 211	262 128	2.3	762
244 118	253 123	266 130	288 142	306 152	331 165	363 184	397 203	410 210	412 211	266 130	2.0	763

NORTH DAKOTA.

275 135	293 145	309 154	338 170	363 184	392 200	414 229	.....	.....	482 250	302 150	3.6	764
257 125	266 130	275 135	298 148	318 159	347 175	387 197	424 218	432 222	453 234	284 140	.8	765
347 175	374 190	392 200	417 214	437 225	462 239	500 260	536 280	536 280	536 280	351 177	1.4	766
212 100	217 103	225 107	235 113	255 124	277 136	311 155	345 174	367 186	379 193	237 114	1.3	767
253 123	264 129	273 134	295 146	320 160	345 174	385 196	424 218	435 224	451 233	282 139	1.0	768
268 131	286 141	295 146	322 161	347 175	374 190	406 208	435 224	.....	435 224	289 143	3.5	769
253 125	264 129	271 133	291 144	311 155	334 168	370 188	405 207	415 213	428 220	279 137	.8	770
196 91	201 94	208 98	225 107	241 116	262 128	307 153	358 180	369 187	396 202	223 106	.8	771

TABLE 15.—Marketing data and analytical figures for gasolines

NORTH DAKOTA—Continued.

Sample No	City.	Company No.	Sample collected from	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
772	Grand Forks.....	11	F.....	35	.....	0.720	64.6	{ 127 53	167 75	181 83	203 95	216 102
773	do.....	3	F.....	32.6	.....	.716	65.5	{ 97 36	122 50	123 56	158 70	185 85
774	do.....	3	F.....	27.3	.....	.760	54.2	{ 111 44	151 66	171 77	208 98	239 115
775	do.....	3	F.....	27.3	.....	.748	57.2	{ 104 40	142 61	165 74	196 91	230 110

OHIO.

776	Cincinnati.....	158	D.....	25½	.....	0.744	58.2	{ 122 50	165 74	180 82	203 95	221 105
777	do.....	184	F.....	25½	.....	.745	57.9	{ 135 57	167 75	183 84	201 94	216 102
778	do.....	184	F.....	35	.....	.710	67.2	{ 113 45	142 61	156 69	171 77	181 83
779	do.....	177	D.....	25½	.....	.740	59.2	{ 111 44	153 67	174 79	205 96	226 108
780	do.....	67	G.....	25½	.....	.737	60.0	{ 111 44	151 66	176 80	207 97	230 110
781	do.....	22	D.....	26	.....	.746	57.7	{ 117 47	156 69	172 78	196 91	217 103
782	Cleveland.....	106	F.....	25½	24½	.782	49.0	{ 145 63	176 80	183 84	192 89	203 95
783	do.....	106	F.....	25½	24½	.782	49.0	{ 120 49	165 74	178 81	192 89	205 96
784	do.....	29	F.....	25½	.....	.789	47.4	{ 163 73	180 82	187 86	198 92	210 99
785	do.....	118	G.....	27	24½	.745	57.9	{ 135 57	172 78	189 87	208 98	225 107
786	do.....	141	F.....	25½	24½	.768	52.8	{ 158 70	190 88	201 94	216 102	230 110
787	do.....	167	F.....	25½	24½	.716	65.5	{ 117 47	145 63	156 69	167 75	180 82
788	do.....	8	F.....	28½	.....	.738	59.7	{ 129 54	165 74	181 83	203 95	221 105
789	do.....	8	F.....	28½	.....	.738	59.7	{ 129 54	163 73	180 82	199 93	219 104
790	do.....	4	F.....	25½	.....	.757	54.9	{ 118 48	160 71	180 82	211 94	223 106
791	do.....	4	F.....	25½	.....	.757	54.9	{ 120 49	171 77	189 87	212 100	230 110
792	do.....	22	F.....	25½	.....	.760	54.2	{ 93 34	165 74	187 86	214 101	234 112
793	Columbus.....	113	F.....	35	.....	.716	65.5	{ 113 45	144 62	153 67	165 74	178 81
794	do.....	113	F.....	25½	.....	.742	58.7	{ 120 49	165 74	187 86	214 101	232 111

collected in the 1919 survey, arranged by States—Continued.

NORTH DAKOTA—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
230 110	237 114	244 118	261 127	279 137	304 151	335 169	365 185	376 191	392 200	252 122	1.2	772
207 97	216 103	226 108	246 119	270 132	297 147	352 178	----- -----	----- -----	397 203	234 112	5.9	773
262 128	275 135	289 143	307 153	325 163	351 177	383 195	419 215	430 221	433 223	280 138	1.8	774
255 124	270 132	280 138	302 150	324 162	351 177	387 197	419 215	428 220	430 221	275 135	2.1	775

OHIO.

239 115	248 120	259 126	279 137	306 152	334 168	378 192	428 220	442 228	450 232	270 132	1.3	776
228 109	235 113	244 118	261 127	282 139	309 154	343 173	379 193	394 201	415 213	257 125	1.2	777
194 90	199 93	205 96	216 102	230 110	246 119	275 135	307 153	316 158	342 172	212 100	1.5	778
243 117	252 122	257 125	277 136	295 146	318 159	351 179	392 200	406 208	414 212	261 127	2.0	779
218 120	255 124	266 130	291 144	322 161	333 167	365 185	401 205	410 210	424 218	270 132	1.5	780
237 114	244 118	253 123	271 133	293 145	316 158	356 180	388 198	399 204	428 220	261 127	.5	781
221 105	235 113	253 123	293 145	320 160	352 178	390 199	419 215	430 221	442 228	273 134	1.2	782
221 105	235 113	257 125	289 143	318 159	351 177	381 195	410 210	417 214	432 222	268 131	.8	783
228 109	241 116	253 123	286 141	316 158	345 174	383 195	417 214	428 220	441 227	273 134	.8	784
237 111	252 122	261 127	282 139	304 151	329 165	365 185	397 203	410 210	432 222	270 132	.8	785
244 118	252 122	264 129	284 140	307 153	327 164	356 180	385 196	396 202	415 213	273 134	.6	786
192 89	198 92	203 95	217 103	234 112	253 123	286 141	334 168	352 178	378 192	217 103	.8	787
239 115	248 120	257 125	282 139	306 152	331 166	365 185	399 204	412 211	424 218	268 131	.8	788
239 115	248 120	257 125	277 136	297 147	325 163	361 183	392 200	408 209	428 220	264 129	.8	789
239 115	250 121	257 125	284 140	311 155	340 171	376 191	412 211	424 218	428 220	270 132	1.8	790
228 109	259 126	270 132	293 145	316 158	340 171	376 191	414 212	426 219	433 223	273 134	1.6	791
257 125	266 130	277 136	298 148	325 163	351 177	387 197	415 213	424 218	437 225	279 137	.9	792
190 88	198 92	203 95	216 102	228 109	248 120	289 143	331 166	352 178	363 184	230 110	1.9	793
244 119	253 123	262 128	280 138	297 147	321 162	358 181	399 204	414 212	432 222	268 131	-----	794

TABLE 15.—Marketing data and analytical figures for gasolines

OHIO—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Retail.	Tank wagon.	Specific gravity.	Degrees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
795	Columbus.....	150	F.....	35	.....	0.726	62.8	{ 95 35	117 47	131 55	158 70	190 88
796	do.....	150	F.....	25½	.....	.730	61.8	{ 97 36	122 50	144 62	178 81	212 100
797	do.....	184	F.....	35	.....	.719	64.7	{ 131 55	163 73	172 78	185 85	198 92
798	do.....	184	F.....	25½	.....	.736	60.2	{ 135 57	167 75	181 83	198 92	212 100
799	do.....	8	F.....	28½	.....	.731	61.5	{ 122 50	158 70	172 78	194 90	210 99
800	do.....	22	F.....	25½	.....	.754	55.7	{ 111 44	158 70	183 84	208 98	230 110
801	Dayton.....	135	F.....	32	.....	.710	67.2	{ 111 44	138 59	151 66	169 76	181 83
802	do.....	135	F.....	25½	.....	.745	57.9	{ 122 50	160 71	176 80	194 90	210 99
803	do.....	6	D.....	28	.....	.740	59.2	{ 99 37	136 58	156 69	189 87	212 100
804	do.....	20	F.....	32	.....	.708	67.7	{ 104 40	136 58	153 67	174 79	183 84
805	do.....	20	F.....	25½	.....	.729	62.0	{ 129 54	163 73	178 81	198 92	216 102
806	do.....	205	F.....	32½	.....	.711	66.9	{ 100 38	127 53	140 60	158 70	174 79
807	do.....	205	F.....	25½	.....	.739	59.4	{ 118 48	156 69	176 80	201 94	219 104
808	do.....	22	F.....	25½	.....	.741	58.9	{ 99 37	142 61	169 76	201 94	225 107
809	Toledo.....	147	F.....	25½	.....	.798	45.4	{ 122 50	160 71	172 78	185 83	194 90
810	do.....	155	G.....	25½	24½	.745	57.9	{ 120 49	160 71	178 81	205 96	228 109
811	do.....	167	F.....	25½	24½	.739	59.4	{ 127 53	155 74	180 82	198 92	212 100
812	do.....	67	G.....	26	24½	.740	59.2	{ 104 40	145 63	165 74	208 98	239 115
813	do.....	1	D.....	25½	24½	.759	54.5	{ 106 41	171 77	190 88	214 101	232 111
814	do.....	22	D.....	25½	.....	.750	56.7	{ 99 37	154 68	181 83	214 101	237 114
815	do.....	77	D.....	25½	24½	.744	58.2	{ 187 86	216 102	223 106	230 110	237 114

OKLAHOMA.

816	Bartlesville.....	11	G.....	{ No sale. }	.....	0.752	56.2	{ 115 46	153 67	189 87	223 106	248 120
817	do.....	166	F.....	23	23	.752	56.2	{ 127 53	183 84	201 94	223 106	241 116

collected in the 1919 survey, arranged by States—Continued.

OHIO—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
237 114	255 124	273 134	306 152	334 168	360 182	405 207	448 231	..... .....	448 231	268 131	3.6	795
243 117	255 124	268 131	293 145	318 159	345 174	385 196	426 219	434 226	441 227	266 130		
205 96	212 100	219 104	234 112	239 115	275 135	316 158	352 178	361 183	383 198	234 112	1.8	797
226 108	232 111	241 116	257 125	275 135	298 149	334 168	367 186	372 189	403 208	252 122		
226 108	232 111	239 115	261 127	282 139	306 152	345 174	378 192	388 198	405 207	252 122	1.0	798
248 120	259 126	270 132	289 143	311 155	338 170	374 190	406 208	419 215	426 219	271 133		
194 90	201 94	207 97	217 103	232 111	248 120	279 137	311 155	324 162	334 168	212 100	1.5	800
225 107	230 110	239 115	255 124	271 133	295 146	334 168	356 180	370 188	387 197	262 128		
232 111	223 116	250 121	273 134	300 149	333 167	388 198	437 225	455 235	455 235	262 128	1.8	803
194 90	199 93	205 96	214 101	228 109	248 120	270 132	298 148	315 157	345 174	210 99		
232 111	239 115	248 120	266 130	284 140	309 154	347 175	379 193	392 200	405 207	255 124	1.4	805
190 88	196 91	201 94	217 103	234 112	255 124	293 145	334 168	356 180	363 184	212 100		
237 114	244 118	253 123	271 133	295 146	324 162	365 185	405 207	419 215	428 220	262 128	1.8	807
244 118	252 122	262 128	282 139	302 150	327 164	367 186	406 208	414 212	414 212	262 128		
205 96	212 100	221 105	241 116	277 136	309 154	352 178	396 202	412 211	417 214	244 118	1.7	809
248 120	253 123	273 134	293 145	313 156	340 171	379 193	424 218	..... .....	437 225	273 134		
226 108	235 113	248 120	268 131	288 142	311 155	343 173	378 192	387 197	401 205	255 124	.4	811
246 119	279 137	286 141	307 153	327 164	351 177	385 196	424 218	..... .....	432 222	277 136		
255 122	262 128	270 132	291 144	313 156	336 169	372 189	410 210	417 214	432 222	273 134	1.0	813
255 124	261 127	273 134	291 144	306 152	324 162	370 182	390 198	399 204	410 210	268 131		
244 118	248 120	253 123	262 128	271 133	284 140	302 150	320 160	336 169	345 174	259 126	.4	815

OKLAHOMA.

266 130	273 134	284 140	309 154	333 167	361 183	403 206	444 229	453 234	453 234	289 143	2.6	816
259 126	266 130	279 136	297 147	320 160	345 174	383 195	446 230	460 238	486 252	288 142		

TABLE 15.—Marketing data and analytical figures for gasolines

OKLAHOMA—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Retail.	Tank wagon.	Specific gravity.	Degrees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
818	Bartlesville.....	8	F.....	25	25	0.751	56.4	{ 140 60	178 81	190 88	210 99	226 108
819	do.....	203	F.....	23	21½	.739	59.4	{ 102 39	113 56	153 67	198 92	243 117
820	do.....	9	F.....	23	23	.747	57.4	{ 135 57	174 79	189 87	208 98	223 106
821	do.....	3	F.....	23	23	.750	56.7	{ 99 37	140 60	163 73	194 90	223 106
822	do.....	1	F.....	23	23	.750	56.7	{ 102 39	162 72	185 85	208 99	226 108
823	do.....	3	T.....	23	23	.748	57.2	{ 122 50	162 72	185 85	217 103	235 113
824	Muskogee.....	120	D.....		23½	.746	57.7	{ 145 63	189 87	199 93	214 101	226 108
825	do.....	15	F.....	25	23½	.740	58.2	{ 84 29	135 57	167 75	216 102	257 125
826	do.....	62	G.....	25		.745	57.9	{ 153 67	183 84	196 91	212 100	223 106
827	do.....	62	F.....	25½	23½	.746	57.7	{ 144 62	176 80	185 85	201 94	214 101
828	do.....	258	F.....	25½	23½	.748	57.2	{ 149 65	187 86	199 93	208 98	225 107
829	do.....	4	F.....	25½	23½	.753	55.9	{ 144 62	176 80	190 88	208 98	223 106
830	do.....	234	F.....	25		.754	55.7	{ 108 42	142 61	162 72	196 93	239 115
831	do.....	1	D.....	25½	23½	.742	58.7	{ 120 49	171 77	189 87	208 98	225 107
832	do.....	240	F.....	25		.748	57.2	{ 165 74	190 88	201 94	217 103	228 109
833	Oklahoma City....	26	F.....	22½	20½	.741	58.9	{ 109 43	129 54	144 62	167 75	189 87
834	do.....	26	F.....	22½	22½	.749	57.1	{ 136 58	172 78	187 86	210 99	234 112
835	do.....	30	G.....	23	21	.752	56.2	{ 145 63	174 79	189 87	214 99	234 112
836	do.....	120	F.....	22½	22½	.747	57.4	{ 147 64	192 86	203 95	223 106	237 114
837	do.....	11	F.....	22½	22½	.746	57.7	{ 144 62	183 84	194 90	219 104	237 114
838	do.....	160	G.....	22½	20½	.748	57.2	{ 158 70	189 87	199 93	219 104	235 113
839	do.....	8	F.....	25½	25½	.746	57.7	{ 147 64	176 80	194 90	216 102	232 111
840	do.....	9	F.....	22½	22½	.747	57.4	{ 158 70	187 86	201 94	223 106	234 112
841	do.....	76	F.....	25	22	.740	59.2	{ 127 53	158 70	171 77	189 87	205 96

collected in the 1919 survey, arranged by States—Continued.

OKLAHOMA—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
239 115	248 120	257 125	273 134	293 145	311 155	340 171	367 186	378 192	408 209	262 128	0.5	818
273 134	284 140	302 150	320 160	340 171	365 185	403 206	446 230	----- -----	446 230	286 141	3.6	819
237 114	243 117	253 123	273 134	295 146	324 162	360 182	397 203	410 210	439 226	266 130	.8	820
248 120	259 126	270 132	297 147	318 159	343 173	385 196	423 217	432 222	433 223	270 132	-----	821
241 116	246 119	252 122	262 128	291 144	311 155	345 174	388 198	397 203	397 203	259 126	2.8	822
257 125	266 130	275 135	297 147	311 155	336 169	374 190	426 219	433 223	437 225	277 136	1.8	823
239 115	244 118	253 123	266 130	284 140	306 152	336 169	365 185	376 191	392 200	261 127	1.0	824
284 140	295 146	302 150	322 151	343 173	370 188	419 215	----- -----	----- -----	432 222	291 144	6.6	825
234 112	241 116	248 120	266 130	284 140	304 151	333 167	360 182	370 188	392 200	259 126	.8	826
228 109	235 113	243 117	260 127	275 135	298 148	327 164	354 179	365 185	381 194	250 121	.7	827
243 117	253 123	262 128	282 139	302 150	324 162	352 178	383 195	390 199	414 212	270 132	2.0	828
239 115	246 119	257 125	280 138	302 150	327 164	360 182	385 196	396 202	414 212	268 131	1.8	829
271 133	291 144	311 155	343 173	369 187	399 204	441 227	451 233	----- -----	451 233	300 149	2.2	830
239 115	246 119	253 123	268 131	284 140	302 150	329 165	360 182	372 189	385 196	255 124	1.8	831
244 118	253 123	257 125	273 134	289 143	311 155	340 177	369 187	378 192	397 203	266 130	.7	832
216 102	234 112	253 123	309 154	360 182	399 204	441 227	448 231	473 245	486 252	279 137	3.0	833
239 115	261 127	268 131	291 144	316 158	345 174	390 199	430 221	433 221	435 224	277 136	2.4	834
257 125	266 130	280 138	304 151	329 165	358 180	392 200	419 215	426 219	437 225	286 141	1.0	835
250 121	257 125	264 129	279 137	298 148	318 159	352 178	388 198	403 206	410 210	271 133	1.8	836
255 124	259 126	275 135	295 146	315 157	336 169	374 190	410 210	423 217	433 223	280 138	1.6	837
253 123	262 128	273 134	295 146	318 159	345 174	390 199	432 222	444 229	457 236	286 141	1.0	838
246 119	257 125	266 130	284 140	306 152	329 165	365 185	408 209	421 216	421 216	273 134	2.7	839
255 124	266 130	275 135	291 144	311 155	336 169	374 190	410 210	424 218	432 222	280 138	1.8	840
223 106	232 111	241 116	262 128	288 142	320 160	370 188	424 218	442 228	446 230	259 126	1.6	841

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TABLE 15.—Marketing data and analytical figures for gasoline

OKLAHOMA—Continued.

Sam- ple No.	City.	Com- pany No.	Sample col- lected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re- tail.	Tank wagon.	Specific gravity.	De- grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
842	Oklahoma City...	76	F.....	25	22½	0.743	58.4	{ 140 90	172 78	185 85	203 95	219 101
843	do.....	1	D.....	23½	22½	.750	56.7	{ 133 56	187 86	205 96	223 103	241 116
844	do.....	1	D.....	23½	22½	.751	56.4	{ 117 47	153 84	201 94	223 106	241 116
845	Tulsa.....	33	F.....	23½	21½	.747	57.4	{ 131 55	178 81	187 86	205 96	217 104
846	do.....	32	F.....	23½	22½	.745	58.1	{ 113 45	156 69	176 80	212 100	241 116
847	do.....	166	F.....	23½	22½	.749	56.9	{ 153 67	187 86	199 93	217 103	234 112
848	do.....	15	F.....	22½	21½	.741	58.9	{ 108 42	144 62	171 77	221 105	257 125
849	do.....	62	F.....	22½	21½	.743	58.4	{ 117 47	144 62	171 77	198 92	219 104
850	do.....	9	F.....	22½	21½	.745	57.9	{ 138 59	172 78	185 85	208 98	230 110
851	do.....	69	F.....	23½	21½	.736	60.2	{ 133 56	163 73	174 79	191 96	214 101
852	do.....	4	F.....	22½	21½	.759	54.5	{ 158 70	194 90	210 99	230 110	248 120
853	do.....	1	F.....	.....	.....	.745	57.9	{ 158 70	194 90	205 96	221 105	235 113
854	do.....	240	F.....	22½	21½	.743	58.4	{ 118 48	158 70	183 84	212 100	234 112
855	do.....	69	F.....	23	21½	.736	60.2	{ 135 57	160 71	174 79	196 91	216 99

OREGON.

856	Portland.....	19	G.....	.....	.....	0.751	56.4	{ 122 50	156 69	172 78	194 90	208 98
857	do.....	19	F.....	22½	.....	.749	56.9	{ 113 45	158 70	178 81	198 92	210 99
858	do.....	19	F.....	22½	.....	.753	55.9	{ 111 41	156 69	172 78	194 90	210 99
859	do.....	16	F.....	22½	.....	.756	55.2	{ 111 44	149 65	169 76	198 92	221 105
860	do.....	16	F.....	22½	.....	.759	55.7	{ 117 47	149 65	167 75	196 91	217 103
861	do.....	13	F.....	22½	.....	.754	55.7	{ 113 45	167 74	185 85	205 96	221 105
862	do.....	13	F.....	22½	.....	.755	55.4	{ 117 47	162 72	181 83	203 95	221 105
863	do.....	14	F.....	22½	.....	.752	56.2	{ 122 50	156 69	171 77	194 90	210 99
864	do.....	14	F.....	22½	.....	.749	56.9	{ 106 41	153 67	169 76	194 90	212 100

collected in the 1919 survey, arranged by States—Continued.

OKLAHOMA—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
237 114	246 119	257 125	275 135	300 149	327 164	379 193	432 222	441 227	444 229	270 132	1.7	842
253 123	282 128	270 132	284 140	302 150	322 161	363 184	.....	.....	403 206	273 134	4.5	843
255 124	261 127	270 132	280 140	300 149	322 161	358 181	406 208	.....	406 208	271 133	3.3	844
226 108	241 116	248 120	266 130	289 143	315 157	356 180	401 205	414 212	424 218	261 127	1.9	845
255 124	273 134	384 140	306 152	327 164	354 179	405 207	.....	.....	433 223	282 139	4.0	846
253 123	264 129	275 135	293 145	316 158	342 172	383 195	428 220	441 227	446 230	282 139	1.8	847
284 140	302 150	315 157	334 168	352 178	374 190	415 213	.....	.....	444 229	298 148	6.2	848
235 113	241 116	253 123	271 133	300 141	325 163	367 186	408 209	419 215	421 216	262 128	2.5	849
252 122	259 126	268 131	288 142	307 153	333 167	374 190	414 212	415 213	415 213	273 134	2.0	850
228 109	235 113	243 117	255 124	273 134	297 147	331 166	363 184	376 191	385 196	248 120	1.9	851
266 130	275 135	284 140	306 152	325 163	349 176	383 195	412 211	423 217	430 221	289 143	1.3	852
225 107	255 124	262 128	275 135	291 144	311 155	340 171	376 191	392 200	397 203	266 130	2.0	853
252 122	264 129	275 135	295 146	320 160	347 175	388 198	437 225	.....	437 225	279 137	3.0	854
225 107	232 111	235 113	257 125	273 134	295 146	327 164	358 181	374 190	385 196	246 119	1.3	855

OREGON.

219 104	225 107	230 110	248 120	264 129	284 140	320 160	363 184	383 195	392 200	241 116	2.0	856
226 108	230 110	257 114	252 122	266 130	288 142	322 161	374 190	390 199	396 202	244 118	2.0	857
221 105	225 107	225 107	250 121	266 130	286 141	320 160	367 186	388 198	392 200	241 116	2.2	858
239 115	248 120	252 122	271 133	282 139	311 155	343 173	388 198	403 206	403 206	255 124	2.5	859
228 109	246 119	253 123	268 131	286 141	309 154	342 172	390 199	401 205	401 205	257 125	3.0	860
230 110	237 114	241 116	255 124	271 133	289 143	320 160	356 180	370 188	387 197	246 119	1.5	861
232 111	237 114	244 118	255 124	270 132	288 142	320 160	360 182	372 189	385 196	246 119	2.0	862
225 107	232 111	239 115	253 123	271 133	293 145	325 163	367 186	383 195	390 198	244 118	2.0	863
226 108	234 112	241 116	253 123	268 131	282 139	320 160	360 182	379 193	388 198	243 117	1.5	864

TABLE 15.—Marketing data and analytical figures for gasolines

PENNSYLVANIA.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	Degrees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
855	Harrisburg.....	18	D.....	27	.....	0.745	57.9	{ 131 55	165 74	181 83	205 96	225 107
866	do.....	141	G.....	29	.....	.791	47.0	{ 156 69	176 80	185 85	194 90	207 97
867	Oil City.....	93	D.....	27	24.3	.730	61.8	{ 91 33	136 58	163 73	228 109	270 132
868	do.....	93	D.....	27	24.3	.729	62.0	{ 90 32	133 56	160 71	239 115	270 132
869	do.....	18	F.....	27	24.3	.720	64.4	{ 102 39	129 54	142 61	162 72	176 80
870	do.....	35	R.....	26	.....	.713	66.4	{ 118 48	147 64	158 70	172 78	185 85
871	do.....	36	R.....	26	24	.712	66.6	{ 122 50	145 63	156 69	169 76	178 81
872	do.....	38	R.....	.....	21	.734	60.7	{ 158 70	192 89	201 94	210 99	217 103
873	do.....	38	R.....	.....	25	.710	67.2	{ 122 50	149 65	158 70	169 76	180 82
874	do.....	49	R.....	28	26	.708	67.7	{ 122 50	147 64	156 69	171 77	181 83
875	do.....	193	F.....	29	27	.700	70.0	{ 91 32	118 48	131 55	153 67	172 78
876	do.....	68	R.....	30	24	.706	68.3	{ 118 48	145 63	154 68	167 75	180 82
877	do.....	68	R.....	.....	.....	.750	56.7	{ 167 75	194 90	199 93	210 99	219 104
878	Philadelphia.....	18	F.....	27	24.3	.746	57.7	{ 118 48	158 70	176 80	212 100	239 115
879	do.....	11	G.....	26	24.3	.749	56.9	{ 156 69	189 87	203 95	221 105	235 113
880	do.....	2	S.....	27	.....	.740	59.2	{ 122 50	147 64	163 73	190 88	210 99
881	do.....	198	S.....	27	.....	.739	59.4	{ 113 45	154 68	174 79	217 103	244 118
882	do.....	230	D.....	.....	24.3	.741	58.9	{ 127 53	165 74	189 87	221 105	244 118
883	do.....	1	F.....	27	24.3	.751	56.4	{ 113 45	147 64	165 74	194 90	217 103
884	Pittsburgh.....	18	R.....	27	25	.742	58.7	{ 111 44	160 71	181 83	216 102	253 123
885	do.....	18	F.....	30	28	.706	68.3	{ 113 45	154 63	172 78	198 92	217 103
886	do.....	27	F.....	27	25	.744	58.2	{ 104 40	144 62	172 78	212 100	235 113
887	do.....	27	F.....	30	28	.720	64.4	{ 82 28	108 42	122 50	149 65	183 84
888	do.....	2	F.....	27	25	.754	55.7	{ 104 40	140 60	158 70	189 87	212 100

collected in the 1919 survey, arranged by States—Continued.

PENNSYLVANIA.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
244 118	246 119	262 128	279 137	306 152	333 167	378 192	423 217	430 221	448 231	271 133	1.6	865
226 108	243 117	268 131	307 153	333 167	358 181	390 199	426 219	439 226	448 231	279 137	1.0	866
289 143	298 148	307 153	324 162	342 172	356 180	401 205	.....	.....	419 215	289 143	6.8	867
288 142	295 146	306 152	320 160	326 169	356 180	406 208	.....	.....	414 212	289 143	7.6	868
190 88	199 93	207 97	225 107	248 120	284 140	342 172	.....	.....	399 204	225 107	4.0	869
196 91	201 94	207 97	216 102	230 110	246 119	271 133	307 153	320 160	324 162	212 100	2.2	870
187 86	208 89	214 92	229 98	270 101	321 115	349 132	365 166	331 176	349 185	210 99	1.8	871
226 108	230 110	235 113	244 118	255 124	270 132	293 145	324 162	338 170	347 175	241 116	1.5	872
189 87	194 90	198 92	208 98	221 105	239 115	262 128	295 146	306 152	316 158	205 96	2.0	873
192 89	198 92	203 95	214 101	225 107	239 115	264 129	304 151	318 159	329 165	208 98	2.0	874
192 89	201 94	212 100	228 109	235 113	270 132	312 156	.....	.....	372 189	216 102	4.5	875
190 88	196 91	201 94	214 101	226 108	243 117	266 130	331 166	349 176	356 180	210 99	2.2	876
230 110	234 112	241 116	253 123	266 130	282 139	311 155	338 170	351 177	361 183	250 121	1.0	877
259 126	268 131	277 136	289 143	318 159	342 172	381 194	428 220	446 230	451 233	279 137	2.4	878
257 125	270 132	280 138	302 150	333 167	378 192	450 232	513 267	.....	.....	304 151	2.0	879
230 110	239 115	248 120	266 130	291 144	320 160	361 183	410 210	428 220	428 220	257 125	2.7	880
264 129	273 134	280 138	297 147	313 156	336 169	370 188	419 215	.....	423 217	275 135	3.3	881
261 127	268 131	275 135	298 148	316 158	340 171	374 190	412 211	428 220	435 225	280 138	2.0	882
237 114	248 120	259 126	284 140	306 152	327 164	361 183	410 210	.....	417 214	262 128	3.4	883
277 136	288 142	298 148	320 160	338 170	360 182	396 202	433 223	450 232	468 238	291 144	2.0	884
241 116	255 124	266 130	288 142	313 156	334 168	370 188	412 211	424 218	424 218	268 131	2.3	885
261 127	273 134	284 140	300 151	327 164	354 179	397 203	433 223	439 226	439 226	280 138	2.7	886
221 105	235 113	250 121	282 139	313 156	345 174	399 204	.....	.....	419 215	252 122	6.0	887
230 110	241 116	252 122	262 128	298 148	327 164	372 189	428 220	.....	432 222	257 125	3.0	888

TABLE 15.—Marketing data and analytical figures for gasolines

PENNSYLVANIA—Continued

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Retail.	Tank wagon.	Specific gravity.	Degrees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
889	Pittsburgh.....	251	D.....	30	28	0.831	38.5	{ 144 62	{ 172 78	{ 180 82	{ 189 87	{ 196 91
890	do.....	251	D.....	30	28	.713	66.4	{ 90 32	{ 109 43	{ 122 50	{ 144 62	{ 171 77
891	do.....	165	F.....	28	26	.734	60.7	{ 100 38	{ 136 58	{ 158 70	{ 203 95	{ 248 120
892	do.....	165	F.....	30	28	.727	62.6	{ 88 31	{ 117 47	{ 138 59	{ 180 82	{ 235 113
893	do.....	61	F.....	30	.....	.710	67.2	{ 93 34	{ 118 48	{ 135 57	{ 158 70	{ 180 82
894	do.....	61	F.....	27	.....	.732	61.3	{ 108 42	{ 154 68	{ 174 79	{ 205 96	{ 226 108
895	do.....	211	D.....	27	25	.749	56.9	{ 95 35	{ 144 62	{ 180 82	{ 225 107	{ 248 120
896	do.....	211	F.....	30	28	.728	62.3	{ 81 27	{ 115 46	{ 133 56	{ 181 83	{ 235 113
897	do.....	87	D.....	27	25	.728	62.3	{ 109 43	{ 157 66	{ 169 76	{ 198 92	{ 225 107
898	do.....	87	D.....	30	28	.720	64.4	{ 108 42	{ 135 58	{ 156 69	{ 181 83	{ 205 96
899	Scranton.....	18	F.....	27	.....	.752	56.2	{ 124 51	{ 160 71	{ 178 81	{ 210 98	{ 228 109
900	do.....	11	F.....	.....	.....	.733	61.0	{ 122 50	{ 153 69	{ 169 76	{ 190 88	{ 212 100
901	do.....	169	D.....	25	.....	.740	59.2	{ 113 45	{ 149 65	{ 171 77	{ 201 94	{ 223 106

RHODE ISLAND.

902	Providence.....	129	F.....	27½	.....	0.747	57.4	{ 99 37	{ 133 56	{ 149 65	{ 176 80	{ 198 92
903	do.....	2	F.....	28	25½	.752	56.2	{ 106 41	{ 126 52	{ 138 59	{ 162 72	{ 183 84
904	do.....	159	G.....	27	25	.752	56.2	{ 151 68	{ 185 85	{ 198 92	{ 212 100	{ 225 107
905	do.....	159	F.....	27	25	.740	59.2	{ 144 62	{ 187 86	{ 198 92	{ 210 99	{ 221 105
906	do.....	5	S.....	28	25½	.745	57.9	{ 124 51	{ 165 74	{ 185 85	{ 217 103	{ 237 114
907	do.....	129	F.....	27½	.....	.758	54.7	{ 108 42	{ 138 59	{ 153 67	{ 176 80	{ 196 91
908	do.....	1	S.....	28	25½	.752	56.2	{ 102 39	{ 131 55	{ 145 63	{ 172 78	{ 196 91
909	do.....	1	F.....	27½	25½	.762	53.7	{ 131 55	{ 153 67	{ 167 75	{ 190 88	{ 212 100

collected in the 1919 survey, arranged by States—Continued.

PENNSYLVANIA—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
203 95	208 98	216 102	239 115	275 135	342 172	414 212	450 232	460 238	471 244	261 127	1.1	889
198 92	208 98	223 106	252 122	275 135	320 160	388 198	-----	-----	421 216	237 114			5.8	890
266 130	289 143	298 148	320 160	338 170	358 181	394 201	437 225	-----	439 226	284 140	3.2	891
271 133	291 144	306 152	324 162	342 172	361 183	392 200	433 223	-----	433 223	279 137			4.0	892
205 96	216 102	228 109	248 120	275 135	309 154	367 186	414 212	-----	415 213	237 114	3.2	893
248 120	259 126	268 131	284 140	302 150	325 163	358 181	394 201	410 210	421 216	266 130		
266 130	275 135	282 139	300 149	320 160	345 174	405 207	-----	-----	428 220	280 138	6.7	895
266 130	280 138	289 143	315 157	340 171	372 189	446 230	-----	-----	453 234	282 139			7.1	896
241 116	252 122	262 128	279 137	300 149	324 162	360 182	390 199	401 205	403 206	261 127	1.9	897
225 107	234 112	243 117	255 124	288 142	313 156	351 177	385 196	401 205	403 206	248 120			1.8	898
250 121	257 125	270 132	288 142	315 157	340 170	376 191	419 215	435 224	439 226	273 134	1.8	899
232 111	243 117	250 121	275 135	306 152	351 177	444 229	502 261	(4) (4)	(4) (4)	277 136			1.8	900
244 118	253 123	264 129	279 137	302 150	327 164	361 183	399 204	417 214	415 215	248 120	1.8	901

RHODE ISLAND.

219 104	230 110	244 118	271 133	297 147	329 165	379 193	-----	-----	419 215	252 122	5.2	902
205 96	216 102	225 107	248 120	284 140	320 150	378 192	414 212	-----	414 212	243 117	3.3	903
235 113	243 117	248 120	261 127	273 134	289 143	318 159	356 180	370 188	381 194	253 123	1.3	904
232 111	235 113	239 115	252 122	266 130	280 138	302 150	324 162	334 168	352 178	244 115	1.0	905
253 123	261 127	268 131	282 139	298 148	325 163	358 181	396 202	410 210	419 215	270 132	2.0	906
217 103	230 110	241 116	264 129	295 146	324 162	356 180	-----	-----	408 209	248 120	3.8	907
216 102	226 108	239 115	268 131	297 147	329 165	376 191	-----	-----	410 210	250 121	4.8	908
232 111	244 118	244 118	280 138	304 151	329 165	361 183	399 204	417 214	430 221	262 128	1.5	909

4 Limit of thermometer.

TABLE 15.—Marketing data and analytical figures for gasolines

SOUTH CAROLINA.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
910	Charleston.....	254	G.....	27	24½	.749	56.9	{ 135 58	169 76	185 85	203 95	221 105
911	do.....	126	G.....	28	24½	.742	58.7	{ 126 52	162 72	178 81	199 93	216 102
912	do.....	11	D.....		24½	.748	57.2	{ 129 54	164 74	183 84	203 95	217 103
913	do.....	7	D.....	24½		.739	59.4	{ 133 56	171 77	183 84	203 95	217 103
914	do.....	1	D.....	27	24½	.749	56.9	{ 151 66	187 86	201 94	219 104	235 113
915	do.....	1	G.....	27	24½	.749	56.9	{ 140 60	185 85	199 93	219 104	235 113
916	Columbia.....	11	F.....	28	26	.744	58.2	{ 133 56	162 72	180 82	201 94	216 102
917	do.....	11	D.....	28	26	.742	58.7	{ 122 50	153 67	169 76	194 90	210 99
918	do.....	2	D.....		26	.726	62.8	{ 122 50	149 65	162 72	176 81	190 88
919	do.....	2	F.....	28	26	.725	63.1	{ 118 48	154 68	167 75	182 84	194 90
920	do.....	7	D.....	28	26	.742	58.7	{ 127 53	167 75	183 84	205 96	223 106
921	do.....	7	F.....	28	26	.740	59.2	{ 133 56	171 77	189 87	207 97	223 106
922	do.....	1	D.....	28	26	.748	57.2	{ 133 56	180 82	194 90	212 100	225 107
923	do.....	1	F.....	28	26	.746	57.7	{ 133 56	180 82	194 90	214 101	230 110

SOUTH DAKOTA.

924	Aberdeen.....	148	G.....	30	26.1	.752	56.2	{ 176 80	203 95	212 100	226 108	239 115
925	do.....	148	G.....	26.1	26.1	.749	56.9	{ 167 75	199 93	210 99	226 108	244 118
926	do.....	8	F.....	29.5	29.5	.748	57.2	{ 122 50	160 71	180 82	203 95	221 105
927	do.....	3	F.....	26.1	26.1	.767	52.5	{ 120 49	178 70	172 78	210 99	243 117
928	do.....	3	G.....	28	26.1	.756	55.2	{ 122 50	151 66	194 88	207 97	241 116
929	Sioux Falls.....	58	G.....	24.9	24.9	.747	57.4	{ 135 57	176 80	190 88	210 99	226 108
930	do.....	290	D.....	40		.685	74.3	{ 90 32	102 39	109 48	118 48	129 54
931	do.....	200	D.....	25		.748	57.2	{ 126 52	169 76	185 85	208 98	228 109
932	do.....	4	D.....	24.9	24.9	.742	58.7	{ 144 62	169 76	183 84	201 94	214 101

collected in the 1919 survey, arranged by States—Continued.

SOUTH CAROLINA.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
234 112	241 116	248 120	261 127	279 137	298 148	333 167	365 185	376 191	392 200	253 123	2.0	910
230 110	235 113	243 117	255 124	271 133	291 144	325 163	358 181	369 187	393 195	246 119	2.0	911
232 111	239 115	246 119	259 126	273 134	298 148	336 169	365 185	374 190	387 197	252 122	2.0	912
230 110	237 114	243 118	257 125	275 135	298 148	334 168	367 186	379 193	392 200	252 122	1.8	913
250 121	255 124	262 128	280 138	298 148	318 159	352 178	381 194	394 201	412 211	271 133	1.9	914
248 120	255 124	261 127	279 137	297 147	316 158	352 178	381 194	396 202	412 211	270 132	2.0	915
230 110	235 113	243 117	257 125	273 134	291 144	327 164	356 180	370 188	387 197	248 120	1.7	916
225 107	230 110	239 115	252 122	261 127	288 142	322 161	352 178	365 185	381 194	243 117	1.8	917
201 94	207 97	212 100	225 107	239 115	259 126	293 145	324 162	336 169	354 179	221 105	1.9	918
207 97	212 100	217 103	230 110	244 117	261 129	300 149	333 167	351 177	360 182	226 108	2.0	919
237 114	244 118	252 122	262 128	282 139	309 154	345 174	379 193	392 200	405 207	257 125	1.9	920
237 114	243 117	250 121	264 129	282 139	306 152	342 172	379 193	394 201	406 208	259 126	1.9	921
243 117	248 120	257 125	273 134	289 143	313 156	343 173	383 195	392 200	394 201	261 127	2.0	922
243 117	250 121	259 126	275 135	288 142	313 156	342 172	367 186	376 191	399 204	246 119	1.0	923

SOUTH DAKOTA.

253 123	261 127	270 132	284 140	300 149	320 160	349 176	378 192	388 198	396 202	275 135	1.9	924
261 127	266 130	275 135	289 143	306 152	325 163	356 180	387 197	394 201	406 208	279 137	1.5	925
243 117	252 122	261 127	282 139	304 151	327 164	365 185	397 203	408 209	421 216	266 130	1.7	926
271 133	284 140	304 151	329 165	351 177	374 190	408 209	435 224	444 229	446 230	293 145	1.9	927
271 133	280 138	295 146	318 159	343 173	369 187	403 206	428 220	430 221	430 221	289 143	1.9	928
243 117	252 122	259 126	273 134	298 148	320 160	354 179	392 200	405 207	415 213	266 130	.9	929
144 62	151 66	162 72	180 82	205 96	234 112	324 162	.....	.....	405 207	190 88	5.8	930
246 119	255 124	264 129	288 142	309 154	333 167	367 186	405 207	419 215	430 221	271 133	2.0	931
230 110	239 115	248 120	266 130	291 144	318 159	360 182	401 205	410 210	426 219	262 128	1.2	932

TABLE 15.—*Marketing data and analytical figures for gasoline*

SOUTH DAKOTA—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	Degrees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
933	Sioux Falls.....	4	D.....	30.9	30.9	0.752	56.2	140 60	181 83	194 90	214 101	232 111
934	do.....	3	D.....	24.9	24.9	.756	55.2	117 47	154 68	181 83	217 103	246 119
935	Vermilion.....	105	X.....	50	.....	.715	65.8	109 43	133 56	142 61	158 70	169 76
936	do.....	133	X.....	40	.....	.730	61.8	90 32	120 49	136 58	171 77	210 99
937	do.....	8	X.....	35	.....	.748	57.2	129 54	165 74	181 83	207 97	226 108
938	do.....	4	G.....	28	.....	.751	56.4	136 58	174 79	190 88	212 100	230 110
939	do.....	3	G.....	28	.....	.755	55.4	120 49	165 72	181 83	210 99	231 112
940	do.....	3	T.....	28	25.1	.765	53.6	163 73	192 89	205 96	230 110	250 121
941	Watertown.....	6	G.....	29.4	25.4	.740	59.2	136 58	163 73	176 80	194 90	208 98
942	do.....	170	F.....	25.4	25.4	.746	57.7	160 71	198 92	214 101	228 109	243 117
943	do.....	170	F.....	35	35	.694	71.7	99 87	111 41	120 49	131 55	144 62
944	do.....	3	F.....	25.4	25.4	.753	55.9	117 47	153 67	174 79	214 101	241 116
945	do.....	3	F.....	32.4	32.4	.740	59.2	104 40	137 57	154 68	180 82	210 99
946	do.....	80	F.....	25.4	25.4	.745	57.9	129 54	169 76	189 87	213 102	237 114

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947	Chattanooga.....	11	D.....	24	24	0.747	57.4	136 58	180 82	199 93	228 109	252 122
948	do.....	2	D.....	24	24	.745	57.9	113 45	145 63	162 72	189 87	208 98
949	do.....	2	D.....	24	.....	.751	56.4	131 55	158 70	176 80	198 92	216 102
950	do.....	223	F.....	24	.....	.748	57.2	129 54	174 79	194 90	225 107	246 119
951	do.....	17	D.....	24	24	.749	56.6	118 48	160 71	186 82	217 103	241 116
952	do.....	17	F.....	24	22	.746	57.7	122 50	169 76	192 80	221 105	234 112
953	Knoxville.....	2	D.....	24½	24½	.739	59.4	111 44	147 64	158 70	185 85	199 93
954	do.....	2	F.....	24	22½	.741	58.9	122 50	149 65	163 73	180 82	214 101
955	do.....	6	D.....	24½	24½	.750	56.7	136 58	172 78	190 88	216 102	235 113

collected in the 1919 survey, arranged by States—Continued.

SOUTH DAKOTA—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
252 122	261 127	273 134	288 142	318 159	347 175	387 197	423 217	433 223	448 231	280 138	1.7	933
270 132	280 138	293 145	316 158	336 169	367 186	406 208	437 225	446 230	446 230	291 144	2.3	934
183 84	190 88	198 92	212 100	226 108	248 120	281 140	329 165	343 173	347 175	207 97	1.9	935
243 117	259 126	273 134	302 150	327 164	356 180	421 216	-----	-----	428 220	270 132	7.7	936
243 117	250 121	266 130	284 140	302 150	334 168	378 192	428 220	442 228	444 229	271 133	2.1	937
248 120	255 124	266 130	291 144	315 157	338 170	379 193	410 210	419 215	439 226	277 136	1.0	938
257 125	268 131	282 139	302 150	320 160	356 180	396 202	442 228	451 233	453 234	282 139	3.0	939
271 133	282 139	291 144	316 158	336 169	360 182	394 201	426 219	433 223	437 225	297 147	1.2	940
223 106	232 111	239 115	261 127	271 133	309 154	338 170	385 196	397 203	410 210	252 122	1.4	941
253 123	261 127	268 131	275 135	297 147	315 157	342 172	370 188	378 192	405 207	273 131	.7	942
158 70	165 74	172 78	192 89	205 96	226 108	279 137	347 175	-----	347 175	189 87	3.4	943
266 130	279 137	289 143	311 155	336 169	361 183	396 202	428 220	442 228	450 232	286 141	2.0	944
235 113	248 120	262 128	288 142	320 160	349 176	392 200	426 219	441 227	446 230	268 131	1.8	945
257 125	266 130	277 136	298 148	318 159	345 174	383 195	424 218	435 224	442 228	280 138	1.8	946

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266 130	275 135	282 139	300 149	320 160	342 172	378 192	415 213	430 221	435 224	286 141	1.8	947
230 110	239 115	250 121	270 132	293 145	318 159	360 182	405 207	423 217	430 221	261 127	1.8	948
232 111	239 115	252 122	273 134	293 145	320 160	361 183	403 206	415 213	432 222	262 128	1.4	949
266 130	273 134	280 138	298 148	316 158	340 171	372 189	406 208	424 218	435 224	282 139	1.5	950
255 124	271 133	280 138	302 150	322 161	343 173	374 190	408 209	423 217	428 220	279 137	2.0	951
261 127	270 132	279 137	297 147	315 157	340 171	374 190	401 205	412 212	424 218	279 137	1.4	952
228 109	237 114	250 121	268 131	293 145	322 161	365 185	410 210	424 218	424 218	255 124	2.6	953
230 110	239 115	246 119	270 132	297 147	325 163	374 190	419 215	430 221	450 221	259 126	2.5	954
255 124	264 139	275 135	295 146	315 157	343 173	381 194	419 215	432 222	446 230	280 138	1.4	955

TABLE 15.—Marketing data and analytical figures for gasolines

TENNESSEE—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Retail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
956	Knoxville.....	6	F.....	25	22½	0.749	56.9	{ 127 33	160 71	180 82	205 96	228 109
957	do.....	17	D.....	24½	24½	.745	57.9	{ 106 41	151 66	178 81	208 98	239 115
958	do.....	17	F.....	25	22½	.754	55.7	{ 122 50	154 68	172 78	212 100	243 117
959	Memphis.....	2	F.....	23	21	.736	60.2	{ 120 49	149 65	160 76	192 89	212 100
960	do.....	2	F.....	23	21	.747	57.4	{ 131 55	165 74	185 85	210 99	232 111
961	do.....	2	F.....	23	21	.750	56.7	{ 115 46	153 67	169 76	194 90	214 101
962	do.....	6	F.....	23	21	.754	55.7	{ 122 50	171 77	189 87	214 101	237 114
963	do.....	6	T.....	23	21	.753	55.9	{ 131 55	165 74	185 85	216 102	237 114
964	do.....	8	F.....	26	24	.748	57.2	{ 145 63	181 83	194 90	217 103	234 112
965	do.....	8	F.....	26	24	.746	57.7	{ 119 65	176 80	199 93	216 102	232 111
966	do.....	17	F.....	23	21	.751	56.4	{ 118 48	165 74	189 87	225 107	252 122
967	do.....	17	F.....	23	21	.752	56.2	{ 118 48	158 70	187 86	219 104	246 119

TEXAS.

968	Brenham.....	2	F.....	24½	22½	0.737	60.0	{ 124 51	154 68	172 78	194 90	210 99
969	do.....	15	F.....	24½	22½	.738	59.7	{ 138 59	171 77	181 83	198 92	214 101
970	do.....	9	G.....			.748	57.2	{ 154 68	187 86	201 94	223 106	243 117
971	do.....	1	G.....	25	22½	.745	57.9	{ 113 45	158 70	181 83	214 101	235 113
972	Dallas.....	2	F.....	24½	24½	.737	60.0	{ 115 46	145 63	167 72	187 86	208 98
973	do.....	15	F.....	24½	22½	.753	55.9	{ 120 49	163 73	181 83	205 96	223 106
974	do.....	15	F.....	24½	22½	.756	55.3	{ 122 50	167 75	189 87	217 103	234 116
975	do.....	64	F.....	24½	22½	.745	57.9	{ 131 55	162 72	169 76	187 86	205 86
976	do.....	9	F.....	22½	22½	.733	61.0	{ 118 48	149 65	163 73	185 85	201 94
977	do.....	9	F.....	24½	22½	.745	57.9	{ 118 48	158 70	174 79	196 91	216 102

collected in the 1919 survey, arranged by States—Continued.

TENNESSEE—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
248 120	257 125	270 132	291 144	313 156	343 173	390 199	437 225	446 230	450 232	277 136	2.0	956
262 128	271 133	280 138	300 149	325 163	349 176	394 201	433 223	----- -----	433 225	280 138	3.1	957
257 125	266 130	280 138	304 151	329 165	354 179	392 200	430 221	439 228	444 229	282 139	1.6	958
230 110	239 115	248 120	268 131	293 145	320 160	367 186	417 214	----- -----	417 214	257 125	3.4	959
244 118	262 128	270 132	293 145	316 158	343 173	387 197	432 222	448 231	453 234	279 137	1.7	960
230 110	243 117	252 122	273 134	295 146	322 161	365 185	417 214	421 214	421 216	259 126	2.7	961
257 125	268 131	280 138	306 152	331 166	361 183	408 209	450 232	462 239	462 239	288 142	1.5	962
257 125	257 125	280 138	306 152	331 166	361 183	410 210	451 233	----- -----	453 234	288 142	2.1	963
241 116	253 123	262 128	277 136	293 145	315 157	345 174	383 195	401 205	406 208	266 130	1.7	964
246 119	248 120	261 127	277 136	291 144	313 156	345 174	381 194	392 200	408 209	268 131	1.0	965
271 133	275 135	291 144	313 156	334 168	360 182	396 202	433 223	441 227	441 227	289 143	2.8	966
261 127	279 137	286 141	306 152	329 165	352 178	388 198	421 216	433 223	437 225	284 140	1.9	967

TEXAS.

225 108	234 112	237 114	257 125	275 135	302 150	340 171	381 194	399 204	403 206	250 121	2.0	968
228 109	237 114	244 118	257 125	280 138	306 152	340 171	374 190	390 199	397 203	253 123	1.0	969
261 127	271 133	282 139	288 142	324 162	347 175	385 196	423 217	433 223	448 231	288 142	1.1	970
252 122	255 124	266 130	288 142	306 152	329 165	365 185	421 216	----- -----	421 216	270 132	3.3	971
225 107	243 117	243 117	259 126	288 142	316 158	356 180	399 204	412 211	412 211	252 122	3.0	972
234 112	248 120	255 124	275 135	293 145	316 158	347 175	381 194	401 205	401 205	259 126	1.6	973
250 121	257 125	266 130	284 140	302 150	324 162	356 180	388 198	405 207	406 208	268 131	1.7	974
225 107	234 112	239 115	266 130	291 144	318 159	363 184	397 203	408 209	415 213	255 124	.7	975
217 103	226 108	232 111	248 120	271 133	298 148	333 167	372 189	387 197	397 203	244 118	1.8	976
232 111	241 116	250 121	268 131	288 142	313 156	354 179	410 210	419 215	421 216	257 125	2.1	977

TABLE 15.—Marketing data and analytical figures for gasolines

TEXAS—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
978	Dallas.....	71	F.....	24½	22½	0.749	56.9	{ 131 55	163 73	178 81	198 92	216 102
979	do.....	90	F.....	24½	22½	.750	56.7	{ 118 48	162 72	178 81	205 96	230 110
980	Fort Worth.....	2	F.....	24½	22½	.735	60.5	{ 118 48	151 66	165 74	187 86	205 96
981	do.....	15	F.....	24½	22½	.743	58.1	{ 113 45	144 62	162 72	190 88	221 105
982	do.....	64	F.....	24½	22½	.745	57.9	{ 145 63	176 80	189 87	207 97	223 106
983	do.....	66	F.....	25	22½	.742	58.7	{ 131 55	167 75	180 82	198 92	216 102
984	do.....	195	F.....			.741	58.9	{ 122 59	153 67	171 77	190 88	207 97
985	do.....	9	F.....	25	23	.747	57.4	{ 129 54	167 75	183 84	203 95	217 103
986	do.....	9	G.....	25	22½	.746	57.7	{ 115 46	162 72	181 83	212 100	231 112
987	do.....	71	G.....	25	22½	.748	57.2	{ 140 60	167 75	181 83	198 92	214 101
988	do.....	1	G.....	25	22½	.746	57.7	{ 104 40	149 65	171 77	199 93	216 104
989	Houston.....	102	F.....	25½	23½	.742	58.7	{ 119 43	163 73	180 82	205 96	221 105
990	do.....	124	F.....	25	22½	.747	57.4	{ 147 64	183 84	196 91	212 100	226 108
991	do.....	124	F.....	25	22½	.747	57.4	{ 147 64	153 81	198 92	212 100	226 108
992	do.....	2	F.....	25½	23½	.742	58.7	{ 106 41	147 64	168 73	187 86	207 97
993	do.....	47	F.....	25½	23½	.749	56.9	{ 147 64	180 82	190 88	207 97	221 105
994	do.....	15	F.....	25½	23½	.728	59.7	{ 136 58	165 74	180 82	196 91	212 100
995	do.....	9	F.....	25½	23½	.747	57.4	{ 136 58	174 79	189 87	210 99	230 110
996	do.....	71	F.....	25½	23½	.750	56.7	{ 144 62	176 80	189 87	207 97	221 105
997	do.....	1	F.....	25½	23½	.745	57.9	{ 102 39	147 64	174 79	207 97	228 109
998	Killeen.....	15	G.....	27	24½	.752	56.2	{ 131 55	163 73	183 84	214 101	232 111
999	do.....	71	G.....	27	24½	.758	54.7	{ 153 67	189 87	201 94	221 105	237 114
1000	San Antonio.....	127	F.....	24½	22½	.745	57.9	{ 140 60	169 76	180 82	199 93	216 102
1001	do.....	2	F.....	24½	22½	.736	60.2	{ 117 47	149 65	165 74	189 87	207 97
1002	do.....	47	G.....	24½	22½	.739	59.4	{ 126 52	151 66	163 73	190 88	212 100

collected in the 1919 survey, arranged by States—Continued.

TEXAS—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
230 110	237 114	246 119	259 126	275 135	295 146	334 168	361 183	372 189	387 197	250 121	1.2	978
252 122	264 129	273 134	297 147	318 159	347 175	379 193	406 208	414 212	421 216	275 135	1.0	979
223 106	232 111	241 116	259 126	277 136	311 155	345 174	387 197	399 204	406 208	248 120	.9	980
244 118	257 125	271 133	297 147	322 161	345 174	383 195	419 215	433 223	433 223	271 133	1.8	981
241 116	250 121	257 125	275 135	302 150	333 167	370 188	414 212	424 218	437 225	271 133	1.2	982
232 111	239 115	248 120	273 134	298 148	329 165	378 192	426 219	441 227	448 231	266 130	.9	983
225 107	232 111	241 116	261 127	284 140	315 157	354 179	394 201	410 210	432 222	255 124	1.0	984
230 110	237 114	243 117	262 128	282 139	302 150	334 168	365 185	376 191	403 206	253 123	.8	985
250 121	257 125	266 130	288 142	307 153	329 165	361 183	406 208	424 218	432 222	270 132	1.8	986
228 109	235 113	243 117	259 126	275 135	297 147	329 165	361 183	370 188	385 196	250 121	1.2	987
241 116	252 122	262 128	280 138	300 149	322 161	354 179	392 200	406 208	415 213	261 127	1.8	988
235 113	243 117	243 117	266 130	286 141	309 154	345 174	388 198	408 209	421 216	257 125	1.8	989
243 117	250 121	259 126	277 136	298 148	329 165	356 180	410 210	417 214	417 214	270 132	1.2	990
246 119	252 122	264 129	282 139	304 151	327 164	365 185	410 210	426 219	441 227	273 134	1.3	991
225 107	234 112	244 118	266 130	293 145	320 160	363 184	403 206	419 215	423 217	253 123	1.8	992
237 114	244 118	253 123	279 132	297 147	320 160	356 180	388 198	403 205	410 210	261 129	1.4	993
226 108	234 112	241 116	255 124	280 138	302 150	338 170	379 193	399 204	399 204	252 122	2.2	994
250 121	259 126	268 131	289 143	311 155	336 169	374 190	410 210	424 218	433 223	275 135	1.7	995
237 114	244 118	250 121	266 130	284 140	306 152	338 170	369 187	379 193	394 201	257 125	1.4	996
248 120	257 125	264 129	282 139	300 149	325 163	361 183	414 212	417 214	417 214	264 129	2.5	997
248 120	257 125	261 127	286 141	307 153	334 168	372 189	415 213	428 220	428 220	273 134	2.0	998
255 124	264 129	273 134	289 143	306 152	336 169	370 188	405 207	419 215	435 224	280 138	1.0	999
232 111	239 115	248 120	270 132	293 145	324 162	369 187	417 214	428 220	435 224	262 128	1.1	1000
225 107	234 112	243 117	262 128	284 140	313 156	363 184	-----	-----	410 210	253 123	4.7	1001
230 110	239 115	246 119	266 130	288 142	318 159	361 183	406 208	423 217	432 222	257 125	1.2	1002

180 QUALITY OF GASOLINE MARKETING IN UNITED STATES.

TABLE 15.—Marketing data and analytical figures for gasolines

TEXAS—Continued.

Sam- ple No.	City.	Com- pany No.	Sample col- lected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re- tail.	Tank wagon.	Specific gravity.	De- trees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
1003	San Antonio.....	15	F.....	24½	22½	0.742	58.7	{ 118 48	163 73	181 83	207 97	223 106
1004	do.....	176	F.....	24½	22½	.743	58.4	{ 129 54	165 74	176 80	199 93	221 105
1005	do.....	64	F.....	24½	22½	.744	58.2	{ 126 52	162 72	174 79	194 90	212 100
1006	do.....	9	F.....	26	24½	.745	57.9	{ 140 60	178 81	190 88	210 99	230 110
1007	do.....	220	F.....	26	24½	.747	57.4	{ 149 65	187 86	194 90	214 101	232 111

UTAH.

1008	Salt Lake City....	10	D.....	27	25	0.752	56.2	{ 122 50	142 61	174 79	210 99	237 114
1009	do.....	10	F.....	27	.....	.756	55.2	{ 120 49	154 68	176 80	212 100	235 113
1010	do.....	10	G.....	27	25	.755	55.4	{ 113 45	145 63	169 76	192 88	230 110
1011	do.....	10	F.....	27	25	.756	55.2	{ 117 47	154 68	176 80	208 98	232 111
1012	do.....	121	G.....	27	25	.753	55.9	{ 113 45	162 72	185 85	204 101	239 115
1013	do.....	81	D.....	26	25	.755	55.4	{ 115 46	120 49	165 74	201 94	226 108
1014	do.....	81	F.....	27	25	.755	55.4	{ 118 48	158 70	178 81	207 97	235 113
1015	do.....	81	R.....	27	25	.751	56.4	{ 115 46	154 68	174 79	210 99	232 111

VERMONT.

1016	Burlington.....	5	D.....	.....	25½	0.743	58.4	{ 138 59	176 80	196 91	223 106	241 116
1017	do.....	5	G.....	28	25½	.741	58.9	{ 138 59	181 83	198 92	221 105	239 115
1018	do.....	1	G.....	28	.....	.748	57.2	{ 140 60	178 81	196 91	219 104	237 114
1019	do.....	1	G.....	28	25½	.749	56.9	{ 138 59	180 82	199 93	226 108	241 116
1020	Montpelier.....	1	F.....	28	25½	.748	57.2	{ 136 58	171 77	192 89	216 102	239 115
1021	do.....	5	S.....	28	25½	.742	58.7	{ 142 61	176 80	198 92	221 105	239 115

collected in the 1919 survey, arranged by States—Continued.

TEXAS—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
237 114	244 118	252 122	268 131	288 142	313 156	352 178	410 210	-----	412 211	268 131	2.8	1003
239 115	243 117	257 125	282 139	307 153	338 170	387 197	424 218	428 220	428 220	270 132		
228 109	237 114	244 118	268 131	297 147	324 162	367 186	401 205	410 210	419 215	261 127	1.3	1005
246 119	253 123	261 127	279 137	302 150	327 164	369 187	419 215	430 221	430 221	271 133		
248 120	257 125	266 130	284 140	302 150	322 161	349 176	383 195	392 200	415 213	279 137	1.7	1007

UTAH.

248 120	271 133	282 139	306 152	331 166	361 183	401 205	433 223	433 223	433 223	282 139	1.9	1008
253 123	268 131	282 139	311 155	336 169	365 185	406 208	446 230	-----	448 231	286 141		
253 123	264 129	279 137	300 149	334 168	369 187	415 213	448 231	460 238	462 239	284 140	1.9	1010
252 122	264 129	275 135	300 149	327 164	378 192	405 207	435 224	446 230	450 232	284 140		
257 125	273 134	286 141	311 155	334 168	365 185	405 207	441 227	448 231	448 231	288 142	2.3	1012
248 120	261 127	273 134	297 147	327 164	363 184	410 210	437 225	424 218	437 225	279 137		
255 124	268 131	277 136	304 151	333 167	361 183	414 212	414 212	-----	417 214	282 139	2.4	1014
253 123	264 129	277 136	295 146	324 162	352 178	394 201	432 222	-----	437 225	279 137		

VERMONT.

255 124	262 128	270 132	280 138	293 145	313 156	340 171	369 187	378 192	383 195	266 130	2.4	1016
253 123	259 126	268 131	284 140	298 148	318 159	345 174	367 186	379 193	387 197	268 131		
252 122	262 128	271 133	291 144	309 154	333 167	365 185	405 207	414 212	419 215	275 135	2.2	1018
259 126	266 130	273 134	293 145	313 156	338 170	369 187	403 206	414 212	428 220	280 138		
261 127	268 131	277 136	293 145	311 155	336 169	370 188	410 210	419 215	432 222	279 137	2.0	1020
255 124	264 129	273 134	284 140	298 148	315 157	342 172	365 185	374 190	388 198	268 131		

TABLE 15.—*Marketing data and analytical figures for gasolines*

VIRGINIA.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-gre Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
1022	Norfolk.....	7	F.....	27	23	0.742	58.7	{ 127 53	172 78	190 88	217 103	234 112
1023	do.....	7	D.....	27	23	.742	58.7	{ 129 54	172 78	190 88	214 101	230 110
1024	do.....	1	F.....	27	23	.752	56.2	{ 111 44	149 65	174 79	203 95	225 107
1026	do.....	1	D.....	27	23	.750	56.7	{ 111 44	145 63	167 75	196 91	219 104
1027	do.....	1	G.....		24	.751	56.4	{ 111 44	1 9 65	171 77	201 94	225 107
1028	Richmond.....	210	D.....	25	23	.754	55.7	{ 126 52	158 70	189 87	241 116	266 130
1029	do.....	210	D.....	26		.725	63.1	{ 90 32	115 46	133 56	165 74	203 95
1030	do.....	7	D.....	25	23	.743	58.4	{ 129 54	172 78	190 88	216 102	234 112
1031	do.....	7	F.....	24	23	.743	58.4	{ 133 56	174 79	194 90	217 103	234 112
1032	do.....	1	G.....		23	.750	56.7	{ 115 46	151 66	171 77	194 90	210 99
1033	do.....	1	F.....	27	23	.749	56.9	{ 140 60	183 84	199 93	225 107	244 118
1034	do.....	1	D.....		23	.750	56.7	{ 131 55	176 80	192 89	219 104	237 114
1035	do.....	1	D.....		23	.750	56.7	{ 129 54	172 78	190 88	217 103	237 114
1036	do.....	1	F.....	24	23	.750	56.7	{ 133 56	180 82	198 92	223 106	243 117

WASHINGTON.

1042	Seattle.....	16	F.....	21½		0.762	53.7	{ 129 54	174 79	192 89	216 102	234 112
1043	do.....	16	D.....	21½	19½	.762	53.7	{ 126 52	169 76	190 88	216 102	234 112
1044	do.....	13	G.....	21½	19½	.755	55.4	{ 127 53	167 75	183 84	201 94	216 102
1045	do.....	13	F.....	21½	19½	.755	55.4	{ 131 55	169 76	185 85	203 95	217 103
1046	do.....	13	G.....	21½	19½	.755	55.4	{ 131 55	174 79	187 86	205 96	219 104
1047	do.....	14	D.....	21½	19½	.750	56.7	{ 108 42	156 69	172 78	196 91	212 100
1048	do.....	14	D.....	14½	12½	.793	46.5	{ 163 73	212 100	234 112	257 125	264 129
1049	do.....	14	F.....	21½	19½	.752	56.2	{ 117 47	156 69	174 79	198 92	214 101
1050	do.....	14	G.....	21½	19½	.751	56.4	{ 109 43	147 64	165 74	189 87	205 96

collected in the 1919 survey, arranged by States—Continued.

VIRGINIA.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
248 120	257 125	264 129	282 139	300 149	324 162	356 180	385 196	394 201	410 210	268 131	1.8	1022
248 120	257 125	264 129	282 139	300 149	322 161	356 180	385 196	396 202	412 211	268 131		
244 118	253 123	264 129	283 142	307 153	331 166	363 184	405 207	417 214	417 214	261 127	3.0	1024
241 116	252 122	262 128	282 139	306 152	325 163	361 183	387 197	401 205	415 213	262 128		
243 117	253 123	264 129	282 139	307 153	327 164	360 182	387 197	401 205	417 214	264 129	2.4	1027
286 141	289 143	302 150	318 159	340 171	363 184	406 208	441 227	----- -----	444 229	298 148		
234 112	250 121	266 130	293 145	318 159	349 176	396 202	----- -----	----- -----	426 219	261 127	4.6	1029
239 115	259 126	268 131	284 140	306 152	327 164	360 182	394 201	405 207	414 212	270 132		
248 120	257 125	264 129	280 138	298 148	320 160	356 180	388 198	397 203	414 212	270 132	1.9	1031
230 110	241 116	253 123	277 136	300 149	325 163	360 182	396 202	408 209	412 211	259 126		
261 127	271 133	284 140	304 151	322 161	347 175	381 194	414 212	423 217	437 225	289 141	2.0	1033
257 125	266 130	277 136	298 148	318 159	342 172	374 190	405 207	414 212	428 220	279 137		
257 125	266 130	275 135	295 146	315 157	342 172	378 192	403 206	412 211	424 218	279 137	2.0	1035
262 128	266 130	277 136	298 148	320 160	342 172	376 191	403 206	412 211	424 218	282 139		

WASHINGTON.

248 120	253 123	261 127	275 135	291 144	311 155	338 170	365 185	378 192	394 201	262 128	1.2	1042
246 119	253 123	261 127	275 135	291 144	311 155	342 172	374 190	----- -----	390 199	262 128		
230 110	235 113	230 110	257 125	271 133	289 143	316 158	343 173	356 180	370 188	244 118	1.5	1044
230 110	235 113	241 116	255 124	271 133	289 143	316 158	347 175	361 183	370 188	246 119		
230 110	239 115	244 118	257 125	275 135	295 146	324 162	365 185	388 198	397 203	252 122	2.0	1046
226 108	234 112	241 116	257 125	275 135	298 148	334 168	376 191	390 199	390 199	246 119		
297 147	309 154	320 160	338 170	360 182	392 200	423 217	453 234	459 237	460 238	318 159	1.0	1048
228 109	234 112	241 116	257 125	275 135	297 147	329 165	365 185	381 194	394 201	248 120		
221 105	226 108	234 112	252 122	266 130	291 144	324 162	354 179	365 185	379 193	239 115	1.3	1050

TABLE 15.—Marketing data and analytical figures for gasolines

WASHINGTON—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	Degrees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
1051	Spokane.....	16	F.....	25	23	0.768	52.3	{ 131 55	180 82	198 92	221 105	237 114
1052	do.....	16	F.....	25	23	.773	51.1	{ 140 60	185 85	199 93	221 105	237 114
1053	do.....	13	F.....	26	24	.769	52.1	{ 133 56	176 80	189 87	208 97	221 105
1054	do.....	13	F.....	25	23	.773	51.1	{ 140 60	180 82	192 89	208 98	223 106
1055	do.....	13	F.....	25	23	.769	52.1	{ 149 65	185 85	205 96	212 100	226 108
1056	do.....	236	F.....	25	23	.776	50.4	{ 112 72	194 90	203 95	217 103	230 110

WEST VIRGINIA.

1057	Charleston.....	6	D.....	26	23½	0.733	61.0	{ 97 36	117 47	133 56	171 77	207 97
1058	do.....	6	G.....	.....	.....	.739	59.4	{ 108 42	127 53	154 68	190 88	216 102
1059	do.....	7	D.....	25½	24½	.721	64.2	{ 104 40	133 56	147 64	171 77	190 88
1060	do.....	7	G.....	26	23½	.721	64.2	{ 104 40	135 57	151 66	178 81	199 93
1061	Huntington.....	6	D.....	.....	23½	.749	56.9	{ 109 43	149 65	171 77	203 95	221 105
1062	do.....	6	G.....	.....	23½	.751	56.4	{ 113 45	149 65	169 76	203 95	230 110
1063	do.....	20	D.....	25	23½	.730	61.8	{ 140 60	183 84	196 91	214 101	230 110
1064	do.....	20	G.....	26	23½	.733	61.0	{ 140 60	183 84	196 91	216 102	230 110
1065	do.....	7	D.....	25	23	.718	65.0	{ 117 47	140 60	153 67	176 80	198 92
1066	do.....	7	G.....	26	23½	.719	64.7	{ 102 39	136 58	154 68	178 81	196 91
1067	Parkersburg.....	187	F.....	25	.....	.718	65.0	{ 90 32	108 42	120 49	153 67	192 89
1068	do.....	7	R.....	.....	.....	.715	65.8	{ 108 42	127 53	140 60	180 82	192 89
1069	do.....	7	F.....	26½	23½	.718	65.0	{ 106 41	131 55	140 60	172 78	198 92
1070	Wheeling.....	39	G.....	28	.....	.710	67.2	{ 90 32	109 43	122 50	142 61	163 73
1071	do.....	137	G.....	27	.....	.728	62.3	{ 79 26	99 37	122 50	181 83	252 122
1072	do.....	211	D.....	27	.....	.745	57.9	{ 113 45	169 76	185 85	207 97	226 108
1073	do.....	7	D.....	27	23½	.722	63.9	{ 95 35	126 52	142 61	172 75	198 92

collected in the 1919 survey, arranged by States—Continued.

WASHINGTON—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
252 122	259 126	264 129	275 135	291 144	302 150	334 168	360 182	372 189	383 195	262 128	1.3	1051
250 121	255 124	262 128	275 135	289 143	315 157	334 168	365 185	374 190	388 198	264 129		
234 112	241 116	246 119	261 127	277 136	298 148	324 162	356 180	367 186	385 196	252 122	1.1	1053
234 112	241 116	246 119	259 126	273 134	295 146	325 163	360 182	376 191	388 198	253 123		
239 115	246 119	250 121	266 130	282 139	298 148	331 166	356 180	372 189	388 198	259 126	1.3	1055
241 116	248 120	253 123	266 130	286 141	304 151	327 164	354 179	370 188	394 201	262 128		

WEST VIRGINIA.

235 113	244 118	264 129	293 145	313 156	356 180	423 217	466 241	..... .....	466 241	270 132	3.7	1057
243 117	257 125	270 132	293 145	329 165	361 183	424 218	475 246	..... .....	475 246	279 137		
214 101	221 105	230 110	239 125	291 144	322 161	379 193	441 227	450 232	450 232	250 121	2.2	1059
217 103	228 109	232 111	261 127	289 143	318 159	385 196	450 232	464 240	464 240	255 124		
243 117	257 125	264 129	300 149	324 162	358 181	410 210	455 235	459 239	459 237	279 137	1.5	1061
253 123	262 128	266 130	300 149	329 165	361 183	414 212	453 234	473 245	482 250	284 140		
246 119	253 123	264 129	284 140	304 151	324 162	352 178	385 196	397 203	414 212	270 132	.8	1063
246 119	255 124	266 130	286 141	306 152	329 165	356 180	399 199	401 205	415 213	271 133		
217 103	226 108	239 115	261 127	284 140	329 165	394 201	464 240	..... .....	471 244	259 126	2.2	1065
221 105	226 108	232 111	261 127	289 143	327 164	388 198	455 235	469 243	469 243	257 125		
250 121	282 139	311 155	347 175	392 200	430 221	509 265	..... .....	..... .....	509 265	300 149	7.0	1067
216 102	232 111	244 118	262 128	293 145	329 165	388 198	457 236	464 240	464 240	255 124		
216 102	230 110	241 116	266 130	293 145	320 160	387 197	461 240	..... .....	468 242	255 124	2.9	1069
189 87	203 95	219 104	246 119	288 142	329 165	383 195	430 221	..... .....	432 222	248 120		
293 145	306 152	318 159	342 172	363 184	388 198	441 227	..... .....	..... .....	457 236	295 146	7.2	1071
237 114	248 120	257 125	280 138	302 150	333 167	378 192	419 215	432 222	437 225	268 131		
219 104	230 113	241 116	264 129	293 145	329 165	370 188	388 198	388 198	388 198	246 119	2.0	1073

TABLE 15.—*Marketing data and analytical figures for gasolines*

WISCONSIN.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Re-tail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
1074	Green Bay.....	101	F.....	23.4	23.4	0.756	55.2	{ 129 54	167 75	187 86	216 102	241 116
1075	do.....	101	F.....	33.7	33.7	.715	65.8	{ 109 43	135 57	144 62	156 69	169 76
1076	do.....	101	F.....	25.9	25.9	.744	58.2	{ 138 59	167 75	180 82	199 93	212 100
1077	do.....	148	G.....	23.4	.....	.738	59.7	{ 88 31	122 50	142 61	176 80	217 103
1078	do.....	3	F.....	23.4	23.4	.748	57.2	{ 99 37	136 58	160 71	198 92	230 110
1079	Madison.....	130	D.....	26.3	.....	.745	57.9	{ 102 39	158 70	178 81	201 94	217 103
1080	do.....	130	D.....	30.3	.....	.723	63.6	{ 126 52	158 70	171 77	185 85	198 92
1081	do.....	197	D.....	24.5	.....	.740	59.2	{ 106 41	144 62	163 73	190 88	217 103
1082	do.....	197	D.....	30.5	.....	.719	64.7	{ 77 25	100 28	117 47	151 66	189 87
1083	do.....	3	F.....	23.2	.....	.748	57.2	{ 102 39	136 58	158 70	198 92	241 116
1084	do.....	3	F.....	28.2	.....	.726	62.8	{ 90 32	113 45	127 53	153 67	178 81
1085	do.....	83	D.....	24.3	.....	.745	57.9	{ 126 72	162 72	178 81	201 94	221 105
1086	do.....	83	D.....	30.3	.....	.723	63.6	{ 118 48	154 68	167 75	181 83	192 89
1087	do.....	83	D.....	34.3	.....	.710	67.2	{ 120 49	147 64	160 71	177 77	180 82
1088	Milwaukee.....	103	F.....	23.1	.....	.754	55.7	{ 111 44	153 67	171 77	196 91	219 104
1089	do.....	103	F.....	26	.....	.737	60.0	{ 120 49	153 67	171 77	192 89	208 98
1090	do.....	103	F.....	30	.....	.726	62.8	{ 115 46	149 65	162 72	180 82	194 90
1091	do.....	194	D.....	24.1	23.1	.743	58.4	{ 136 58	183 84	198 92	217 103	230 110
1092	do.....	194	D.....	27	26	.724	63.4	{ 120 49	167 75	185 85	203 95	217 103
1093	do.....	194	D.....	31	30	.719	64.7	{ 120 49	145 63	167 75	178 81	190 88
1094	do.....	194	D.....	35	34	.707	68.0	{ 111 44	135 57	145 63	163 73	176 80
1095	do.....	194	D.....	41	40	.682	75.3	{ 111 44	131 55	140 60	151 66	162 72
1096	do.....	3	F.....	23.1	.....	.758	54.7	{ 100 38	129 54	149 65	190 82	208 98
1097	do.....	3	F.....	28.1	.....	.726	62.8	{ 91 33	117 47	133 56	160 71	185 85

collected in the 1919 survey, arranged by States—Continued.

WISCONSIN.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
262 128	273 134	284 140	307 153	338 170	356 180	392 200	428 220	442 228	457 236	288 142	1.2	1074
181 83	185 85	192 89	203 95	221 105	244 118	286 141	336 169	356 180	379 193	208 98	1.1	1075
234 112	243 121	250 131	270 132	295 146	325 163	370 188	410 210	424 218	433 223	264 129	1.0	1076
257 125	286 141	306 152	342 172	370 188	406 208	466 241	-----	-----	475 246	295 146	6.4	1077
264 129	277 136	289 143	311 155	331 166	356 180	394 201	432 222	442 228	442 228	279 137	2.3	1078
237 114	248 120	259 126	284 140	311 155	347 175	405 207	469 243	482 250	482 250	275 135	2.0	1079
208 98	212 100	219 104	230 110	243 117	261 127	289 143	322 161	335 169	358 181	226 108	1.0	1080
237 114	250 121	259 126	277 136	298 148	327 164	374 190	412 211	424 218	424 219	261 127	2.6	1081
226 108	239 115	255 124	289 143	318 159	343 173	401 205	-----	-----	415 213	253 123	6.8	1082
275 135	293 145	309 154	320 160	356 180	394 201	430 221	462 239	-----	462 239	295 146	3.4	1083
201 94	210 99	223 106	246 119	289 143	335 168	390 199	428 220	-----	433 223	243 117	2.7	1084
239 115	250 121	261 127	275 135	300 149	329 165	370 188	408 209	421 216	437 225	268 131	1.1	1085
203 95	208 98	214 101	226 108	244 118	262 128	288 142	334 168	343 173	363 184	223 106	1.8	1086
190 89	198 92	205 96	216 102	226 108	244 118	270 132	300 149	311 155	331 166	210 99	1.5	1087
234 112	252 122	264 129	288 142	315 157	349 176	383 195	417 214	426 219	444 229	270 132	1.0	1088
228 109	239 115	248 120	268 131	288 142	324 162	363 184	410 210	426 219	430 221	259 126	2.0	1089
208 98	214 101	221 105	234 112	252 122	271 133	313 156	351 177	365 185	397 203	232 111	.8	1090
239 115	252 122	257 124	273 134	289 143	309 154	338 170	370 188	387 197	405 207	262 128	.6	1091
230 110	237 114	244 118	259 126	275 135	298 148	327 164	356 180	370 188	399 204	252 122	.6	1092
201 94	207 97	212 100	226 108	243 117	268 131	306 152	336 169	345 174	367 186	225 107	1.0	1093
189 87	196 91	206 94	214 101	216 102	243 117	270 132	300 149	313 156	334 168	205 96	.9	1094
172 78	176 80	183 84	194 90	205 96	223 106	255 124	295 146	311 155	315 157	192 89	2.5	1095
246 119	270 132	291 144	327 164	358 181	387 197	419 215	442 228	446 230	446 230	282 139	2.9	1096
208 98	221 105	230 110	262 128	300 149	336 169	390 199	430 221	-----	430 221	248 120	2.9	1097

TABLE 15.—Marketing data and analytical figures for gasolines

WISCONSIN—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price, cents per gallon.		Gravity at 15° C.		Distillation.				
				Retail.	Tank wagon.	Specific gravity.	De-grees Baumé.	First drop.	5 per cent mark.	10 per cent mark.	20 per cent mark.	30 per cent mark.
1098	Milwaukee.....	242	F.....	27	26	0.733	61.0	{ 117 47	{ 147 64	{ 165 74	{ 183 84	{ 199 92
1099	do.....	242	F.....	24	23	.753	55.9	{ 120 49	{ 165 74	{ 189 87	{ 212 100	{ 235 113
1100	do.....	242	F.....	35	34	.712	66.6	{ 109 43	{ 138 59	{ 149 65	{ 167 75	{ 181 83

WYOMING.

1101	Cheyenne.....	60	D.....	30	30	0.756	55.2	{ 122 50	{ 153 67	{ 174 79	{ 207 97	{ 232 111
1102	do.....	60	D.....	30	30	.756	55.2	{ 111 44	{ 144 62	{ 165 74	{ 207 97	{ 250 121
1103	do.....	60	D.....	30	.....	.753	55.9	{ 108 42	{ 154 68	{ 172 78	{ 210 99	{ 239 115
1104	do.....	60	D.....	30	30	.754	55.7	{ 127 53	{ 165 74	{ 180 82	{ 199 93	{ 225 107
1105	do.....	186	F.....	28	.....	.753	55.9	{ 106 41	{ 153 67	{ 176 80	{ 221 105	{ 252 122

¹ In this column D means "distributing station"; F, "filling station"; G, "garage"; P, "gasoline plant"; R, "refinery"; S, "service station"; T, "tank wagon"; W, "warehouse"; X, "retail store".

collected in the 1919 survey, arranged by States—Continued.

WISCONSIN—Continued.

Distillation—Continued.											Distillation loss, per cent.	Sample No.
40 per cent mark.	45 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	96 per cent mark.	Dry point.	Average boiling point.		
216 102	223 106	230 110	246 119	264 129	288 142	320 160	356 180	369 187	396 202	239 115	0.9	1098
253 123	270 132	280 138	302 150	322 161	349 176	387 197	423 217	435 224	450 232	282 139		
196 91	201 94	208 98	214 101	230 110	253 123	286 141	313 156	331 166	347 175	212 100	1.7	1100

WYOMING.

255 124	264 129	280 138	293 145	338 170	372 189	421 216	462 239	480 249	480 249	288 142	2.3	1101
284 140	297 147	311 155	334 168	354 179	383 195	424 218	475 246	..... .....	475 246	309 149		
264 129	273 134	284 140	309 154	331 166	360 182	397 203	441 227	460 238	468 242	286 141	1.8	1103
246 119	257 125	268 131	295 146	327 164	361 183	410 210	450 232	462 239	475 246	284 140		
280 138	293 145	302 150	325 163	347 175	372 189	412 211	453 234	..... .....	459 237	295 146	2.4	1105

² For each sample the upper line shows results in degrees Fahrenheit and the lower line in degrees centigrade.

TABLE 16.—Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies.

LARGE REFINERS AND MARKETERS.

Sam- ple No.	Com- pany No.	Color. ¹	Odor.	Acidity. ²			Unsat- uration (per cent).	Doctor test. ³	Corrosion and gumming test. ⁴		Gravity.		Selected distillation results. ⁵					A ver- age boil- ing point.
				Methyl orange.	Litmus paper.	Phenol- phtha- lein (drops).			Nature of residue.	Weight of residue (grams).	Specific gravity.	°B.	Initial boil- ing point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	
260	1	W. W.....	Good.....	—	—	1	6.0	—	Gum.....	.021	0.746	57.7	{ 118 48	221 105	259 126	345 174	405 130	266
266	1	W. W.....	Fair.....	—	—	1	5.0	—	S. corr., gum.....	.023	.746	57.7	{ 122 50	214 101	266 130	356 181	419 215	270
269	1	W. W.....	do.....	—	±	2	2.0	—	S. gum.....	.009	.742	58.7	{ 108 42	219 104	262 128	342 172	399 204	262
274	1	S. Y. T.....	Poor.....	—	—	2	1.5	—	S. corr., gum.....	.012	.755	55.4	{ 126 52	212 100	261 129	330 182	428 220	270
273	1	S. Y. T.....	Good.....	—	—	2	1.0	—	do.....	.021	.756	55.2	{ 117 47	216 102	270 132	370 188	442 228	273
272	1	Y'ish.....	Poor.....	—	—	1	1.5	—	Corr., gum.....	.027	.755	55.4	{ 118 48	208 98	284 129	361 183	426 219	268
319	1	Y'ish.....	Good.....	—	—	2	4.5	—	Oil.....	.032	.762	53.7	{ 111 44	208 98	288 142	428 220	450 232	289
328	1	Y'ish.....	Poor.....	—	—	1	6.0	+	do.....	.066	.756	55.2	{ 109 43	210 99	293 145	417 214	473 245	143
334	1	Y'ish.....	do.....	—	—	2	4.0	+	do.....	.038	.762	53.7	{ 120 49	217 103	288 142	421 216	477 247	295
340	1	Y'ish.....	do.....	—	—	2	5.0	+	do.....	.032	.756	55.2	{ 106 41	192 89	288 142	399 204	451 233	282
344	1	S. Y.....	Fair.....	—	—	1	3.0	—	Corr., gum.....	.023	.751	56.4	{ 115 46	212 100	275 135	367 186	419 215	271
350	1	W. W.....	do.....	+	±	4	4.0	—	do.....	.029	.749	56.9	{ 100 38	181 83	248 120	370 188	414 212	255
357	1	S. Y.....	Fair.....	—	±	1	8.0	—	S. corr., oily gum.....	.030	.755	55.4	{ 115 46	174 79	241 116	367 186	434 216	252
363	1	L. B.....	do.....	—	±	1	2.0	—	Corr., gum.....	.038	.756	55.2	{ 117 47	192 89	255 124	354 179	417 214	259
369	1	O. K.....	O. K.....	—	—	—	3.5	—	Oil, gum, corr.....	.080	.745	57.9	{ 124 51	212 100	266 130	356 180	403 206	266
368	1	O. K.....	do.....	—	—	—	2.0	—	Corr., gum.....	.052	.745	57.9	{ 124 51	212 100	266 130	356 180	403 206	266
374	1	S. Y.....	Fair.....	—	±	1	4.0	—	Gum, pecan, cor.....	.020	.749	56.9	{ 127 53	214 101	273 134	356 180	426 219	271
375	1	S. Y.....	do.....	—	±	1	3.0	—	Corr., gum.....	.027	.749	56.9	{ 131 55	217 103	268 131	356 180	421 216	271

380	1	L. B.....	Poor.....	—	±	2	4.0	—	do.....	.019	.746	57.7	127	207	268	354	412	268
381	1	S. Y.....	Fair.....	—	±	1	2.0	—	do.....	.020	.750	56.7	135	212	271	356	412	271
386	1	S. Y.....	do.....	—	±	1	4.0	—	None.....	.....	.740	59.2	113	221	259	347	403	262
392	1	W. W.....	Good.....	—	—	1	4.0	—	Gum.....	.021	.751	56.4	113	214	259	342	415	268
398	1	Y. T.....	do.....	—	—	1	2.5	—	Corr.....	.047	.742	58.7	124	208	270	367	401	270
397	1	Y'ish.....	Poor.....	—	—	2	3.5	—	.....	.....	.750	56.7	147	219	271	358	406	275
414	1	Y. T.....	Benzol.....	—	—	1	1.5	—	Gum.....	.012	.757	54.9	106	187	253	352	410	255
415	1	Y. T.....	Slight benzol..	+	±	2	1.5	—	S. corr.....	.011	.759	54.5	102	192	257	360	412	259
508	1	S. Y.....	Poor.....	—	—	2	1.0	—	Corr., gum.....	.020	.749	56.9	131	217	271	361	421	273
509	1	Bloom.....	Good.....	—	—	2	2.0	—	Corr., heavy oil..	1.180	.750	56.6	129	216	275	367	435	277
518	1	W. W.....	do.....	—	—	1	4.0	—	Corr., gum.....	.023	.748	57.2	113	221	275	363	421	273
526	1	Y. T.....	do.....	—	—	.....	3.0	—	S. corr., gum.....	.019	.747	57.4	118	219	273	376	421	275
527	1	Y'ish.....	do.....	—	—	.....	1.5	—	do.....	.019	.748	57.2	111	210	271	369	424	270
536	1	Y'ish.....	do.....	—	—	3	4.5	—	Corr., gum.....	.021	.749	56.9	109	194	255	374	415	261
553	1	W. W.....	Fair.....	—	±	1	4.0	—	Corr., oily gum.....	.020	.751	56.4	104	176	243	365	426	250
560	1	Y'ish.....	Poor.....	—	±	1	3.0	—	Corr., gum.....	.048	.753	55.9	127	210	271	360	414	270
564	1	W. W.....	Good.....	—	±	2	3.5	—	Corr., oil.....	.073	.762	53.7	117	190	253	370	421	259
610	1	W. W.....	do.....	—	±	1	2.0	—	.....	.....	.746	57.7	108	212	270	361	430	270
612	1	W. W.....	Fair.....	—	±	1	2.0	—	Trace gum.....	.007	.743	58.4	113	214	270	363	433	271
649	1	W. W.....	Good.....	—	±	1	1.0	—	Gum.....	.005	.745	57.9	158	208	248	324	378	253
650	1	Y'ish.....	Poor.....	—	—	1	1.5	—	S. corr., gum.....	.011	.745	57.9	131	210	248	334	387	255
656	1	S. Y. T.....	do.....	—	—	2	4.0	—	Oil.....	.011	.759	54.5	149	203	264	401	450	279
													60	95	129	205	232	137

¹ In the color column, W. W. means "water white"; Y. T., "yellow tint"; S. Y. T., "slight yellow tint"; Y'ish, "yellowish"; Bloom, "fluorescent color"; S. Y., "slightly yellow"; L. B., "light brown."

² Tests giving an acid reaction with methyl orange indicator, or litmus paper, are reported (+), neutral tests, (—). No sample gave an alkaline reaction. Results of phenolphthalein tests are expressed in number of drops of N/100 NaOH solution required to produce a pink color.

³ Negative doctor tests are reported (—); positive tests are reported (+), and doubtful tests (±).

⁴ In the residue column, Corr. represents "corrosion"; S. corr., "slight corrosion"; Peac., "peacock color, iridescence."

⁵ For each sample the upper line of figures represents temperatures in degrees Fahrenheit, and the lower line in degrees centigrade.

TABLE 16.—Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies—Continued.

LABOR REFINERS AND MARKETERS—Continued.

Sample No.	Company No.	Color.	Odor.	Acidity.			Unsaturation (per cent).	Doctor test.	Corrosion and gumming test.		Gravity.		Selected distillation results.					Average boiling point.
				Methyl orange.	Litmus paper.	Phenolphthalein (drops).			Nature of residue.	Weight of residue (grams).	Specific gravity.	°B.	Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	
682	1	L. B.	Poor.	—	±	1	4.0	—	Corr., oil.	.016	.743	58.4	106	201	266	360	430	264
685	1	Y'ish.	do.	—	—	1	4.5	—	Corr., gum.	.031	.749	56.9	122	181	235	356	417	221
690	1	Y'ish.	do.	—	—	1	4.0	—	Corr., oil.	.032	.752	56.2	113	178	234	360	419	241
694	1	L. B.	do.	—	±	1	3.0	—	Gum, peac. corr.	.012	.754	55.7	111	185	250	361	457	238
677	1	S. Y. T.	Good.	—	—	4	4.0	—	Corr., oily gum.	.024	.746	57.7	102	180	239	356	399	261
697	1	Y'ish.	Poor.	—	—	1	1.5	—	S. corr., gum.	.007	.757	54.9	115	219	257	340	388	248
698	1	W. W.	Good.	—	±	1	2.0	—	Gum.	.002	.750	56.7	122	223	262	338	399	261
701	1	Y. T.	Poor.	—	—	1	3.5	—	—	—	.750	56.7	120	189	252	352	392	262
708	1	O. K.	O. K.	—	—	2	3.0	—	—	—	.749	56.9	109	181	237	360	399	253
724	1	W. W.	Fair	—	—	2	2.0	—	Gum, corr.	.023	.747	57.4	88	181	277	401	430	248
725	1	S. Y.	do.	+	—	3	2.0	—	Gum.	.027	.755	55.4	122	205	259	354	415	270
728	1	O. K.	O. K.	—	—	1	2.0	—	Corr., oily gum.	.066	.753	55.9	115	198	253	361	413	264
752	1	W. W.	Good	+	—	1	4.0	—	S. corr.	.004	.730	61.8	127	189	230	322	394	129
756	1	O. K.	O. K.	—	—	—	4.0	—	Corr., powder.	.039	.754	55.7	117	190	262	360	417	259
757	1	O. K.	do.	—	—	—	3.0	—	S. corr.	.024	.752	56.2	113	196	257	356	410	241
761	1	O. K.	do.	—	—	—	3.0	—	Corr.	.000	.762	53.7	133	208	266	369	421	116
762	1	O. K.	do.	—	—	—	4.0	—	do.	.040	.752	56.2	118	199	262	358	412	264
763	1	O. K.	do.	—	—	—	3.0	—	S. oil, corr.	.027	.753	55.9	118	203	266	363	412	271
822	1	Yellow.	Fair.	—	—	3	2.0	—	Gum.	.028	.750	56.7	102	210	252	345	397	259
831	1	W. W.	Good.	—	±	2	2.0	—	Gum, oil.	.007	.742	58.7	120	208	253	329	385	255
													49	98	123	165	196	124

843	1	Y'ish.....	do.....	—	—	1	2.0	—	Corr., gum.....	.013	.750	56.7	133	223	270	363	403	273
844	1	Y'ish.....	do.....	—	—	2	1.5	—	S. corr., gum.....	.028	.751	56.4	117	223	270	358	406	134
853	1	W. W.....	do.....	±	±	2	1.0	—	Gum.....	.013	.745	57.9	158	221	262	340	397	266
883	1	Y'ish.....	Poor.....	±	±	1	6.0	—	Oily gum, corr.....	.029	.751	56.4	113	194	259	361	417	262
907	1	S. Y.....	Fair.....	±	±	2	8.0	—	Gum, corr.....	.029	.758	54.7	108	176	241	356	408	248
908	1	W. W.....	do.....	±	±	2	6.0	—	Corr., oil, gum.....	.029	.752	56.2	102	172	229	376	410	234
909	1	L. B.....	do.....	±	±	1	6.0	+	.....	.....	.762	53.7	131	190	244	361	430	262
914	1	O. K.....	O. K.....	—	—	.....	4.0	—	Gum, corr.....	.033	.749	56.9	142	219	262	352	412	271
915	1	O. K.....	do.....	—	—	.....	2.5	—	do.....	.035	.749	56.9	161	219	261	352	412	270
922	1	O. K.....	do.....	—	—	.....	2.0	—	S. corr.....	.013	.748	57.2	133	212	257	343	394	261
923	1	O. K.....	do.....	—	—	.....	.....	—	.....	.....	.746	57.7	56	214	259	342	399	246
971	1	W. W.....	Good.....	+	±	2	1.5	—	S. gum.....	.008	.745	57.9	113	214	266	363	421	270
979	1	Y'ish.....	do.....	—	—	1	2.0	—	S. gum, oil.....	.015	.750	56.7	118	205	273	379	421	275
988	1	W. W.....	Poor.....	—	±	1	1.0	—	S. corr., gum.....	.014	.746	57.7	104	199	262	354	415	261
997	1	W. W.....	Good.....	—	±	1	2.5	—	do.....	.012	.745	57.9	102	207	264	361	417	264
1018	1	Y. T.....	do.....	—	—	2	3.0	—	Peac. corr., gum.....	.016	.748	57.2	140	219	271	365	419	275
1019	1	Y. T.....	do.....	—	—	2	2.5	—	Corr., oily gum.....	.029	.749	56.9	138	226	273	369	428	280
1020	1	Y'ish.....	Poor.....	—	—	2	2.5	—	Corr., gum.....	.043	.748	57.2	136	216	277	370	432	279
1024	1	O. K.....	O. K.....	.....	±	.....	2.0	±	S. corr.....	.018	.752	56.2	111	203	264	363	417	261
1025	1	O. K.....	do.....	—	—	.....	3.5	±	do.....	.008	.752	56.2	111	201	264	363	415	264
1027	1	O. K.....	do.....	—	—	.....	3.0	±	do.....	.012	.751	56.4	111	201	264	360	417	264
1032	1	O. K.....	do.....	—	—	.....	3.0	±	S. gum.....	.007	.750	56.7	115	194	253	340	412	259
1033	1	O. K.....	do.....	—	—	.....	4.0	—	Gum.....	.010	.749	56.9	160	225	284	381	437	286
1036	1	O. K.....	do.....	—	—	.....	6.0	—	S. gum.....	.021	.750	56.7	133	223	277	376	424	282
1035	1	O. K.....	do.....	—	—	.....	4.5	—	Corr., gum.....	.018	.750	56.7	129	217	275	378	424	279
1034	1	O. K.....	do.....	—	—	.....	5.0	—	Gum.....	.013	.750	56.7	154	213	277	374	428	287
1041	1	Y'ish.....	Good.....	—	—	2	4.0	—	Oily gum, corr.....	0.033	0.750	56.7	115	205	266	365	419	266
													46	96	130	185	215	130

TABLE 16.—Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies—Continued.

LARGE REFINERS AND MARKETERS—Continued.

Sam- ple No.	Com- pany No.	Color.	Odor.	Acidity.			Unsat- uration (per cent).	Doctor test.	Corrosion and gumming test.		Gravity.		Selected distillation results.				Aver- age boil- ing point.		
				Methyl orange.	Litmus paper.	Phenol- pthalein (drops).			Nature of residue.	Weight of residue (grams).	Specific gravity.	°B.	Initial boil- ing point.	20 per cent mark.	50 per cent mark.	90 per cent mark.		Dry point.	
256	2	Y'ish.....	Fair.....	—	—	1	4.0	+	Corr. gum.....	.031	.735	60.5	{	113	192	248	365	433	257
262	2	W. W.....	do.....	—	±	2	3.0	+	Bad corr., oil.....	.382	.738	59.7	{	45	89	120	185	223	125
267	2	Y'ish.....	Poor.....	—	±	1	2.0	+	Bad corr., s. gum.....	.018	.738	59.7	{	113	169	244	367	430	253
342	2	S. Y.....	do.....	—	—	1	2.0	—	Corr., s. gum.....	.015	.750	56.7	{	45	76	118	186	221	123
341	2	S. Y.....	do.....	—	—	2	2.0	+	Corr., gum.....	.026	.739	59.4	{	111	183	243	356	424	252
345	2	W. W.....	do.....	—	—	1	3.0	±	do.....	.022	.739	59.4	{	44	84	117	180	218	122
355	2	S. Y.....	Fair.....	—	—	1	2.0	+	do.....	.022	.739	59.4	{	133	217	275	374	437	279
364	2	O. K.....	O. K.....	—	—	—	2.0	—	do.....	.022	.734	60.7	{	56	103	135	190	225	137
365	2	O. K.....	do.....	—	—	—	2.0	—	do.....	.033	.731	61.5	{	113	198	261	369	435	264
370	2	L. B.....	Poor.....	+	±	2	4.0	±	do.....	.030	.741	58.9	{	45	92	127	187	220	129
371	2	L. B.....	do.....	+	±	2	2.0	±	Bad corr., gum.....	.022	.741	58.9	{	104	189	259	370	424	262
376	2	L. B.....	Fair.....	+	±	2	3.0	+	Corr., gum.....	.022	.743	58.4	{	118	196	237	363	428	262
377	2	S. Y.....	do.....	—	±	1	2.0	—	Oily gum, trace corr.....	.032	.746	57.7	{	49	86	106	157	204	113
383	2	S. Y.....	Poor.....	—	±	2	3.0	—	Corr., gum.....	.020	.748	57.2	{	120	190	235	354	423	253
384	2	Y'ish.....	do.....	—	±	2	2.0	—	Corr., s. gum.....	.013	.748	57.2	{	49	88	113	179	217	123
388	2	S. Y.....	Fair.....	—	—	1	6.0	—	Corr., oil.....	.047	.750	56.7	{	127	198	246	365	432	264
389	2	W. W.....	do.....	—	—	1	2.0	—	S. corr., oil.....	.031	.746	57.7	{	131	196	244	345	426	257
393	2	Y'ish.....	Good.....	—	—	2	3.0	+	Corr.....	.016	.734	60.7	{	127	192	239	352	430	255
394	2	Y'ish.....	Poor.....	—	—	2	4.0	+	Bad corr., gum.....	.070	.739	59.4	{	53	89	115	178	221	124
													{	136	185	241	370	439	259
													{	58	85	116	188	226	126
													{	122	187	244	369	441	259
													{	50	86	118	187	227	126
													{	185	241	352	415	250	121
													{	85	116	178	213	121	121
													{	113	183	243	354	410	250
													{	45	84	117	179	210	120

TABLE 16.—Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies—Continued.

LARGE REFINERS AND MARKETERS—Continued.

Sam- ple No.	Com- pany No.	Color.	Odor.	Acidity.			Unsat- uration (per cent).	Doctor test.	Corrosion and gumming test.		Gravity.		Selected distillation results.					Aver- age boil- ing point.
				Methyl orange.	Litmus paper.	Phenol- phthal- ein (drops).			Nature of residue.	Weight of residue (grams).	Specific gravity.	°B.	Initial boil- ing point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	
953	2	Y'ish.....	Good.....	—	—	2	2.0	—	Corr., gum.....	0.022	0.739	59.4	111	185	250	365	424	255
954	2	Y'ish.....	Fair.....	—	—	2	2.0	—	do.....	.027	.741	58.9	122	180	246	374	430	124
959	2	Y'ish.....	do.....	—	±	4	2.5	—	S. gum.....	.012	.736	60.2	120	192	248	367	417	259
960	2	W. W.....	Poor.....	+	±	3	4.0	—	Corr., gum.....	.016	.747	57.4	131	210	270	387	453	125
961	2	W. W.....	Good.....	+	±	3	2.5	—	do.....	.011	.750	56.7	115	194	262	365	421	137
968	2	Y'ish.....	do.....	—	±	2	2.0	—	S. gum.....	.015	.737	60.0	124	194	237	340	406	126
972	2	Y'ish.....	Very good.....	—	±	3	1.5	—	Corr., gum.....	.015	.737	60.0	115	187	243	336	412	191
980	2	Y'ish.....	Good.....	+	+	5	2.0	—	do.....	.052	.735	60.5	118	187	241	345	406	238
992	2	W. W.....	do.....	—	±	2	3.0	±	do.....	.028	.742	58.7	106	187	244	363	423	253
1001	2	Y'ish.....	do.....	—	—	3	2.0	—	do.....	.003	.736	60.2	117	189	243	363	410	253
413	3	Y'ish.....	Poor.....	+	±	2	9.0	—	Gum, s. corr.....	.032	.759	54.4	32	88	154	217	234	145
412	3	Y. T.....	do.....	—	—	1	8.5	—	S. corr.....	.034	.760	54.2	38	85	151	215	229	289
435	3	W. W.....	Benzol.....	+	+	3	2.5	—	Corr.....	.043	.746	57.7	102	203	284	426	484	143
436	3	Y. T.....	Good.....	+	+	2	9.0	—	Corr., gum.....	.017	.751	56.4	91	199	313	437	464	298
421	3	S. Y. T.....	Very poor.....	—	±	1	8.0	±	do.....	.009	.752	56.2	111	198	291	419	460	291
431	3	Y'ish.....	Poor.....	—	±	2	7.0	±	S. corr., gum.....	.017	.755	55.4	108	208	298	403	442	288
439	3	Y'ish.....	do.....	—	±	2	12.0	—	Corr., gum.....	.032	.753	55.9	102	196	298	423	455	291
404	3	Yellow.....	do.....	—	±	2	9.0	±	Gum.....	.023	.760	54.2	118	207	306	421	457	298
451	3	Y'ish.....	do.....	—	+	2	8.0	—	S. corr., gum.....	.023	.755	55.4	115	192	301	421	460	295
443		W. W.....	do.....	+	+	2	5.5	±	do.....	.020	.735	60.5	91	207	307	421	462	297
													33	97	153	216	239	147

463	3	Y'ish.	do.	-	±	2	8.5	-	Corr., gum.	.036	.754	55.7	113	207	302	309	450	289
471	3	S. Y.	do.	-	±	1	6.0	+	Oily res.	.027	.750	50.7	113	205	282	415	477	288
472	3	S. Y.	Fair.	-	±	1	.....	.....	.....	.....	.....	.....	93	162	259	428	471	270
597	3	Y'ish.	Poor.	-	-	1	8.0	-	Corr., gum.	.049	.754	55.7	106	196	291	396	406	271
603	3	Y'ish.	Good.	-	-	2	8.5	-	S. corr., gum.	.040	.759	54.5	111	192	298	415	444	289
604	3	Y'ish.	do.	-	-	3	11.0	+	Bad corr., oil.	.038	.743	58.4	108	203	282	401	437	280
483	3	Y. T.	Poor.	-	±	2	11.5	±	Corr., gum, oil.	.027	.747	57.4	102	203	298	432	462	295
495	3	S. Y.	Fair.	+	±	3	8.0	-	Corr., gum.	.020	.751	56.4	117	217	286	397	446	146
474	3	W. W.	do.	+	±	2	10.0	-	Oil.	.089	.753	55.9	118	225	298	415	464	298
773	3	Y'ish.	Poor.	+	-	1	12.0	+	Gum.	.010	.716	65.5	97	158	226	352	397	234
774	3	Y'ish.	do.	-	-	2	2.0	-	S. corr., gum.	.016	.760	54.2	111	208	289	383	433	280
775	3	Y'ish.	do.	-	-	2	5.5	-	do.	.037	.748	57.2	104	196	280	387	430	275
769	3	Y'ish.	Good.	-	-	2	7.0	+	Corr., oil.	.028	.757	54.9	109	210	295	406	435	289
821	3	W. W.	do.	-	±	1	13.0	-	Gum.	.032	.750	56.7	99	194	270	285	433	270
823	3	W. W.	Fair.	-	-	4	2.0	-	Very bad corr., oily gum.	.059	.748	57.2	122	217	275	374	437	277
944	3	S. Y.	Very bad.	-	±	2	10.0	-	Gum.	.028	.753	55.9	117	214	289	396	450	286
945	3	Y'ish.	Poor.	-	-	1	4.0	-	S. corr., gum.	.028	.740	59.2	104	180	262	352	446	258
934	3	Y'ish.	do.	-	-	1	9.0	+	Gum.	.025	.756	55.2	117	217	293	406	446	291
939	3	Y'ish.	do.	-	-	2	8.0	+	do.	.013	.755	55.4	120	210	282	396	453	282
940	3	Y'ish.	do.	-	-	2	7.5	+	S. corr., gum.	.025	.765	53.0	163	230	291	394	437	297
927	3	S. Y. T.	do.	-	-	3	11.0	-	do.	.020	.767	52.5	120	210	304	408	446	293
928	3	Y'ish.	do.	-	-	2	6.0	-	Gum, oil.	.019	.756	55.2	122	207	295	403	430	289
1083	3	Y'ish.	Bad.	-	±	2	8.0	±	S. corr., oil.	.061	.748	57.2	102	198	309	430	462	295
1084	3	Y'ish.	Poor.	-	-	1	10.5	-	S. corr., gum.	.022	.726	62.8	90	153	223	390	433	243
1096	3	Y'ish.	do.	-	±	2	8.0	-	do.	.011	.756	55.2	100	180	291	419	446	282
1097	3	Y'ish.	do.	-	±	2	9.5	-	do.	.010	.726	62.8	91	160	210	380	430	218
				-	±	2	.....	.....	.....	.....	.....	.....	33	71	110	199	421	120

TABLE 16.—Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies—Continued.

LARGE REFINERIES AND MARKETERS—Continued.

Sam- ple No.	Com- pany No.	Color.	Odor.	Acidity.			Unsat- uration (per cent).	Doctor test.	Corrosion and gumming test.		Gravity.		Selected distillation results.					Aver- age boil- ing point.
				Methyl orange.	Litmus paper.	Phenol- phthal- ein (drops).			Nature of residue.	Weight of residue (grams)	Specific gravity.	°B.	Initial boil- ing point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	
1078	3	Y'ish.....	Good.....	—	±	2	11.0	—	Corr., gum.....	0.023	0.748	57.2	{ 99 37	198 92	289 143	394 201	442 421	279 137
646	3	Y'ish.....	Benzol.....	—	±	2	7.5	—	S. corr., oil.....	.071	.749	56.9	{ 99 37	196 91	288 142	421 216	289 457	289 133
645	3	Y'ish.....	Poor.....	—	±	1	10.0	—	S. corr., gum.....	.056	.748	57.2	{ 97 36	194 90	289 143	417 214	284 236	284 140
633	3	Y'ish.....	Fair.....	+	±	4	11.5	+	Corr., gum, oil.....	.043	.743	58.4	{ 100 38	163 73	282 139	433 223	464 240	284 140
627	3	Y'ish.....	Poor.....	—	—	3	9.0	+	Corr., gum.....	.040	.747	57.4	{ 109 43	217 103	286 141	388 198	439 226	284 140
617	3	Y'ish.....	do.....	—	—	2	9.0	+	Gum.....	.024	.747	57.4	{ 100 38	199 93	295 146	430 226	480 249	295 146
582	3	W. W.....	do.....	+	±	2	2.0	—	Corr., gum.....	.023	.755	55.4	{ 93 34	190 88	309 154	423 217	451 233	293 145
583	3	W. W.....	do.....	+	±	3	10.0	—	do.....	.028	.732	61.3	{ 95 35	162 72	243 117	410 210	441 227	259 126
590	3	Y'ish.....	do.....	+	±	2	9.5	—	Gum, oil.....	.049	.752	56.2	{ 109 43	217 103	288 142	379 220	428 238	280 138
574	3	Y'ish.....	do.....	—	±	2	10.5	—	do.....	.023	.755	55.4	{ 95 35	185 85	284 140	405 207	441 227	279 137
575	3	W. W.....	do.....	—	±	2	12.0	—	Corr., gum.....	.018	.725	63.1	{ 93 34	153 67	228 109	403 206	426 219	268 119
585	3	Y'ish.....	do.....	—	—	2	6.0	—	S. corr., gum.....	.017	.756	55.2	{ 129 51	190 88	297 147	387 223	388 233	288 142
586	3	Y'ish.....	do.....	—	—	2	7.0	—	do.....	.019	.755	55.4	{ 127 53	221 105	298 148	388 223	393 243	290 143
587	3	Y'ish.....	do.....	+	±	2	7.0	—	do.....	.023	.758	54.7	{ 127 53	217 103	293 145	392 200	433 223	288 142
566	3	S. Y. T.....	do.....	—	—	2	7.0	—	do.....	.015	.756	55.2	{ 124 51	225 107	291 144	383 223	433 223	288 142
318	4	W. W.....	Fair.....	—	—	2	0.0	+	S. gum.....	.003	.756	55.2	{ 142 61	217 103	273 134	374 190	424 218	279 137
327	4	Y. T.....	Good.....	—	—	2	1.0	+	Gum.....	.015	.751	56.4	{ 126 52	214 101	271 133	370 188	419 215	273 134
333	4	W. W.....	do.....	—	—	2	1.0	+	Oil.....	.011	.749	56.9	{ 118 48	205 96	280 138	354 179	405 207	264 120
339	4	S. Y. T.....	do.....	+	±	4	1.0	—	Gum.....	.019	.747	57.4	{ 127 53	210 99	257 125	363 184	424 218	268 131
410	4	Y'ish.....	Poor.....	—	±	2	5.0	—	Corr., gum.....	.033	.750	56.7	{ 113 45	207 97	266 130	372 189	430 221	270 132

411	4	Y. T.....	Good.....	—	±	2	4.0	—	0.016	0.757	54.9	115	208	266	370	432	271
429	4	W. W.....	do.....	—	±	2	3.0	—	.016	.751	56.4	113	190	273	379	446	277
430	4	W. W.....	do.....	—	—	1	1.5	+	.011	.730	61.8	133	185	223	309	378	234
441	4	Y'ish.....	Very poor.....	—	±	2	3.0	—	.027	.738	59.7	108	203	266	376	414	298
442	4	S. Y.....	Poor.....	+	±	2	2.0	—	.024	.738	59.7	117	216	273	379	439	191
462	4	Y. T.....	Good.....	—	—	1	1.0	+	.007	.730	61.8	131	181	223	307	376	236
461	4	Y. T.....	do.....	—	±	2	1.5	—	.017	.753	55.9	122	212	271	383	442	277
482	4	S. Y.....	Poor.....	—	±	2	4.0	+	.027	.749	56.9	120	210	266	367	428	271
481	4	S. Y.....	do.....	+	±	2	4.0	+	.021	.747	57.4	108	167	255	363	421	261
494	4	S. Y.....	Fair.....	—	±	3	2.5	+	.023	.748	57.2	120	277	277	379	430	279
551	4	Y'ish.....	do.....	—	±	2	6.0	—	.033	.755	55.4	118	214	244	372	424	270
557	4	W. W.....	Good.....	—	±	2	3.0	—	.017	.758	54.7	144	217	275	370	432	280
558	4	W. W.....	do.....	+	±	2	1.0	—	.024	.759	54.5	113	221	221	379	442	279
573	4	W. W.....	Poor.....	+	±	2	3.0	±	.056	.752	56.2	129	217	277	387	457	282
572	4	S. Y.....	Fair.....	—	±	2	3.5	±	.046	.752	56.2	131	223	282	387	459	286
571	4	W. W.....	Poor.....	+	±	3	1.5	—	.113	.750	56.7	126	207	271	380	450	277
626	4	W. W.....	Good.....	—	—	2	1.5	—	.021	.749	56.9	149	212	270	381	430	279
671	4	W. W.....	do.....	—	±	1	1.5	—	.028	.748	57.2	144	212	268	378	426	275
696	4	Y'ish.....	Poor.....	—	±	1	3.0	—	.004	.750	56.7	145	217	271	365	424	275
699	4	Y'ish.....	do.....	—	—	2	2.0	—	.015	.758	54.7	144	217	273	356	410	271
716	4	S. Y.....	do.....	+	±	3	5.0	—	.098	.756	5.25	122	202	271	378	432	275
737	4	Y'ish.....	do.....	—	±	2	2.0	—	.030	.757	54.9	122	210	271	378	435	275
767	4	Y'ish.....	Good.....	—	—	1	0.5	+	.004	.732	61.3	140	189	225	311	379	237
768	4	Y'ish.....	Poor.....	—	—	2	0.5	—	.009	.751	56.4	140	212	273	385	451	282
791	4	Y'ish.....	Fair.....	—	—	3	5.0	—	.028	.757	54.9	120	212	270	376	433	273
790	4	S. Y.....	Good.....	—	—	2	4.5	—	.032	.757	54.9	118	201	257	376	428	270
												48	94	125	191	220	132

TABLE 16.—Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies—Continued.

LARGE REFINERS AND MARKETERS—Continued.

Sam- ple No.	Com- pany No.	Color.	Odor.	Acidity.			Unsat- uration (per cent).	Doctor test.	Corrosion and gumming test.		Gravity.		Selected distillation results.					Aver- age boil- ing point.
				Methyl orange.	Litmus paper.	Phenol- phthal- ate (drops).			Nature of residue.	Weight of residue (grams).	Specific gravity.	°B.	Initial boil- ing point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	
813	4	Y'ish.....	Poor.....	+	—	2	4.0	—	Corr., gum, oil.....	0.029	0.759	51.5	106	214	270	372	432	273
829	4	L. B.....	Fair.....	—	—	1	2.0	+	Gum.....	.003	.753	55.9	111	101	132	189	222	134
852	4	W. W.....	Good.....	+	—	3	1.0	+	Oil.....	.029	.759	54.5	62	98	125	360	414	268
932	4	W. W.....	do.....	—	—	1	2.0	+	S. corr.....	.007	.742	58.7	70	110	110	383	430	131
933	4	W. W.....	do.....	—	—	1	2.5	—	Corr., gum.....	.013	.752	56.2	62	94	120	360	426	262
938	4	S. Y. T.....	do.....	—	+	1	2.0	—	S. corr., gum.....	.016	.751	56.4	60	101	131	387	418	280
343	5	S. Y.....	Fair.....	—	—	1	7.0	+	do.....	.....	.744	58.2	58	100	130	379	439	277
349	5	S. Y.....	do.....	—	±	1	8.0	+	Gum.....	.009	.742	58.7	126	212	264	352	408	268
356	5	Yellow.....	Poor.....	+	±	3	7.0	+	Solid.....	.019	.743	58.7	131	212	261	352	408	266
528	5	Y'ish.....	Good.....	—	—	1	6.0	—	Gum.....	.042	.740	59.2	129	214	268	361	415	271
533	5	Y'ish.....	do.....	—	—	1	3.0	+	do.....	.008	.742	58.7	54	101	131	183	213	133
532	5	Y'ish.....	do.....	—	—	1	8.0	—	Corr., gum.....	.048	.750	56.7	131	230	282	367	421	284
535	5	Y'ish.....	do.....	—	—	2	6.0	+	Corr.....	.020	.740	59.2	131	210	261	352	408	264
552	5	W. W.....	Bad.....	—	±	1	5.0	+	S. corr., gum.....	.012	.747	57.4	122	210	264	351	406	264
559	5	W. W.....	Fair.....	—	±	1	8.0	+	do.....	.013	.740	59.2	136	216	268	356	410	270
565	5	Y'ish.....	Poor.....	—	—	2	6.0	—	S. corr., oil.....	.044	.754	55.7	53	97	125	180	214	130
673A	5	Y. T.....	Good.....	—	—	2	5.5	+	Corr.....	.014	.738	59.7	133	207	257	356	417	266
676	5	S. Y. T.....	Poor.....	—	—	2	7.0	+	do.....	.016	.740	59.2	127	210	266	354	403	266
675	5	Y'ish.....	do.....	—	—	1	6.0	—	Corr., gum.....	.014	.739	59.4	126	210	264	354	406	266
678A	5	Y. T.....	Good.....	—	—	2	6.5	+	Corr.....	.020	.740	59.2	131	212	264	351	410	265
													55	101	129	177	210	130

678	5	Y. T.	do.....	-	-	2	6.0	+	Corr., gum.....	.018	.741	58.9	133	216	264	356	415	271
700	5	Y'ish.....	Poor.....	-	-	1	5.5	+	do.....	.023	.750	56.7	56	102	129	180	213	133
707	5	O. K.....	O. K.....	-	-	4	5.0	-	do.....	.....	.742	58.7	59	99	266	351	408	268
717	5	W. W.....	Good.....	-	-	2	5.0	+	Gum.....	.004	.750	56.7	127	219	266	351	408	268
718	5	W. W.....	Poor.....	-	±	2	5.5	+	Corr., gum.....	.016	.749	56.9	133	219	271	354	414	271
723	5	S. Y.....	Fair.....	+	-	4	4.0	-	Oil.....	.246	.735	60.5	140	221	273	360	412	275
722	5	W. W.....	do.....	+	-	3	2.0	+	do.....	.032	.735	60.5	60	105	134	182	211	135
726	5	O. K.....	O. K.....	-	-	.....	4.0	+	Corr.....	.021	.741	58.9	131	207	248	365	484	266
727	5	O. K.....	do.....	-	-	1	3.0	+	do.....	.022	.740	59.2	138	214	253	338	435	262
738	5	W. W.....	Poor.....	-	±	1	2.0	±	Oil.....	.049	.736	60.2	133	221	268	356	410	278
739	5	Y. T.....	do.....	-	±	1	2.5	±	do.....	.009	.736	60.2	133	216	266	361	408	271
740	5	W. W.....	Good.....	-	-	2	3.0	±	do.....	.027	.750	56.7	136	203	246	351	428	259
741	5	S. Y. T.....	Poor.....	-	-	1	2.0	-	Gum.....	.009	.738	59.7	151	219	268	349	397	271
743	5	Y. T.....	Fair.....	-	-	1	6.0	-	Corr., gum.....	.012	.750	56.7	131	221	275	374	433	280
747	5	Y. T.....	Good.....	-	-	1	10.5	-	S. corr.....	.019	.745	57.9	131	216	268	340	388	138
906	5	S. Y.....	Fair.....	-	±	1	6.0	+	Gum.....	.032	.745	57.9	124	217	268	338	419	259
1016	5	Y. T.....	Good.....	-	-	2	8.0	-	Corr., gum.....	.013	.743	58.4	138	223	270	340	383	266
1017	5	Y. T.....	do.....	-	-	1	6.0	-	Peac.....	.....	.741	58.9	138	221	268	345	387	268
1021	5	Y. T.....	Poor.....	-	-	2	9.0	-	S. corr., gum.....	.016	.742	58.7	142	221	273	342	388	268
257	6	Y'ish.....	do.....	-	-	2	1.0	+	Oily gum.....	.019	.753	55.9	172	239	284	369	435	291
346	6	S. Y.....	do.....	-	-	2	4.0	+	Corr., gum.....	.048	.750	56.7	78	115	140	187	224	144
403	6	W. W.....	Good.....	-	-	1	4.0	+	do.....	.016	.753	55.9	126	207	273	401	468	282
432	6	Y. T.....	do.....	+	+	4	2.0	+	do.....	.062	.753	55.9	136	225	281	394	455	291
437	6	Y'ish.....	Poor.....	-	-	2	8.0	+	do.....	.020	.754	55.7	131	216	271	383	462	280
440	6	Y'ish.....	do.....	+	+	2	4.0	+	Gum, oil.....	.036	.721	64.2	120	210	280	388	448	275
448	6	Y'ish.....	Very poor.....	+	+	2	2.0	+	Corr.....	.045	.749	56.9	49	99	266	351	408	268
													106	190	268	401	471	277
													93		131	205	244	136

TABLE 16.—Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies—Continued.

Sam- ple No.	Com- pany No.	Color.	Odor.	Acidity.			Unsat- uration (per cent).	Doctor test.	Corrosion and gumming test.		Gravity.		Selected distillation results.					Aver- age boil- ing point.
				Methyl orange.	Litmus paper.	Phenol- phthal- ein (drops).			Nature of residue.	Weight of residue (grams).	Specific gravity.	°B.	Initial boil- ing point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	
449	6	S. Y.	Poor.	+	+	2	1.5	+	Corr., oil.	0.072	0.751	56.4	117	207	277	417	471	286
498	6	W. W.	Good.	—	—	2	3.0	+	Bad corr., oil.	.054	.755	55.4	126	219	280	410	244	141
499	6	S. Y.	do.	—	—	1	3.0	+	Corr., gum.	.079	.732	61.3	104	167	253	432	496	291
515	6	Y'ish.	Poor.	—	—	2	6.0	—	S. corr., oily gum.	.056	.751	56.4	131	217	289	403	462	271
570	6	Y'ish.	do.	+	+	5	3.5	+	Corr., gum, oil.	.086	.754	55.7	127	217	286	415	473	293
730	6	Y. T.	Good.	+	+	5	2.5	+	Corr., oil.	.083	.749	56.9	117	212	280	410	460	145
731	6	Y. T.	do.	+	+	5	2.5	+	do.	.051	.750	56.7	115	208	279	410	457	286
750	6	W. W.	do.	—	—	1	2.0	+	Bad corr., gum.	.070	.740	53.2	127	201	243	347	419	140
753	6	O. K.	O. K.	—	—	—	3.0	+	Bad corr., oil.	.054	.741	55.9	129	196	241	338	417	255
803	6	Y'ish.	Poor.	—	+	2	2.0	+	Corr.	.028	.740	56.2	99	189	250	388	455	252
941	6	S. Y.	do.	—	—	4	3.5	+	Bad corr.	.042	.740	53.2	136	194	239	338	410	262
956	6	W. W.	Good.	—	—	1	2.0	—	Corr., oil.	.033	.749	56.9	127	205	270	390	430	138
955	6	W. W.	do.	—	—	1	2.0	—	S. corr., gum.	.009	.750	56.7	136	216	275	381	446	277
963	6	Y'ish.	Poor.	+	—	5	2.0	+	Bad corr., gum.	.052	.753	55.9	131	216	280	410	453	280
963	6	Y'ish.	do.	+	—	4	3.5	+	do.	.062	.754	55.7	122	214	280	408	462	288
1057	6	S. Y.	Fair.	—	—	1	2.0	+	Corr., oil.	.025	.733	61.0	97	171	264	399	423	142
1058	6	S. Y.	do.	—	—	2	2.0	+	Corr., oily gum.	.031	.739	59.4	108	190	270	424	475	288
1062	6	Y'ish.	do.	—	—	2	4.0	+	Corr., gum.	.069	.751	56.4	113	203	266	414	482	284
1061	6	S. Y.	do.	—	—	2	4.0	+	Corr., oil.	.067	.749	56.9	109	203	264	410	459	140
545	7	S. Y.	Poor.	—	±	1	3.0	+	S. corr.	.007	.741	58.9	140	214	262	342	405	137
													60	101	128	172	207	129

681	7	Y'ish.	do.	-	±	1	2.0	+	Corr., oil, gum.	.016	.751	56.4	115	199	275	381	441	273
684	7	Y'ish.	Good.	-	-	1	2.5	+	Corr., gum.	.024	.749	56.9	147	210	263	352	415	194
689	7	Y'ish.	Poor.	-	-	1	7.5	+	S. corr., gum.	.017	.750	56.7	138	97	199	178	213	208
693	7	Y'ish.	do.	-	±	2	4.0	+	Corr., gum.	.023	.748	57.2	111	186	273	363	415	131
751	7	Yellow.	do.	-	-	2	5.0	+	Oil.	.064	.750	56.7	44	91	134	184	213	135
755	7	O. K.	O. K.	-	-	.....	6.0	-	S. corr., gum.	.027	.747	57.4	55	165	282	372	423	280
754	7	Y'ish.	do.	-	-	.....	7.0	-	Bad corr., hard pitch.	.332	.747	57.4	53	163	273	372	424	277
760	7	O. K.	do.	-	-	.....	6.0	-	Corr., gum.	.034	.752	56.2	56	104	135	189	218	136
759	7	O. K.	do.	-	-	.....	6.0	-	Gum.	.018	.751	56.4	58	110	138	185	218	138
921	7	O. K.	do.	-	-	.....	5.0	-	do.	.023	.740	59.2	53	105	135	183	215	135
920	7	O. K.	do.	-	-	.....	5.0	-	S. corr.	.015	.742	58.7	56	97	121	172	208	126
913	7	O. K.	do.	-	-	.....	5.5	-	Corr., gum.	.068	.739	59.4	33	203	244	334	392	252
1023	7	O. K.	do.	-	-	.....	3.5	±	S. corr.	.013	.742	58.7	54	101	129	180	211	131
1022	7	O. K.	do.	-	-	.....	4.0	±	do.	.022	.742	58.7	127	217	264	356	410	268
1031	7	O. K.	do.	-	-	.....	5.0	+	Corr.	.027	.743	58.4	133	217	264	356	414	270
1030	7	O. K.	do.	-	-	.....	5.0	-	Gum, sediment.	.031	.743	58.4	56	103	129	180	212	132
1040	7	Y'ish.	Poor.	+	-	4	1.0	+	Corr.	.018	.739	59.4	129	216	268	360	414	270
1060	7	W. W.	Fair.	-	-	2	3.0	-	Oil.	.065	.721	64.2	54	102	131	182	212	132
1059	7	W. W.	Good.	-	-	1	2.0	-	do.	.140	.721	64.2	57	102	134	185	215	136
1066	7	W. W.	Fair.	-	-	3	2.0	-	do.	.166	.719	64.7	104	178	232	385	464	255
1065	7	W. W.	Good.	-	-	1	3.0	-	do.	.196	.718	65.0	40	81	111	196	240	124
1068	7	Y'ish.	Fair.	-	-	2	3.0	-	do.	.050	.715	65.8	102	178	232	388	463	257
1069	7	W. W.	Fair.	-	-	2	3.0	-	Foreign matter.	.065	.718	65.0	117	176	239	394	471	259
1073	7	Y. T.	Good.	-	-	3	2.0	-	Corr., oil.	.086	.722	63.9	47	80	115	198	244	126
285	8	W. W.	Fair.	+	-	2	2.0	-	S. gum.	.007	.750	56.7	108	180	244	388	464	255
284	8	Y'ish.	Good.	-	-	2	4.0	-	do.	.015	.749	56.9	42	82	118	198	240	124

TABLE 16.—Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies—Continued.

LARGE REFINERS AND MARKETERS—Continued.

Sam- ple No.	Color.	Odor.	Acidity.			Unsat- uration (per cent).	Doclor test.	Corrosion and gumming test.		Gravity.		Selected distillation results.					Aver- age boil- ing point.
			Methyl orange.	Litmus paper.	Phenol- phthal- ion (drops).			Nature of residue.	Weight of residue (grams).	Specific gravity.	°B.	Initial boil- ing point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	
420	8 Y. T.	Poor	—	—	1	3.0	—	Corr., gum.	.043	.748	57.2	133	214	262	358	428	270
433	8 S. Y. T.	Good	—	—	1	5.0	—	Gum.	.007	.756	55.2	136	101	128	181	220	132
438	8 W. W.	do.	—	—	2	8.0	—	S. corr., gum.	.020	.749	56.9	158	106	223	356	412	275
450	8 S. Y. T.	Poor	—	+	3	1.5	—	Corr.	.085	.749	56.9	124	101	244	334	390	252
480	8 Y'ish.	do.	—	—	2	6.0	+	Gum.	.017	.751	56.4	151	94	118	168	199	122
493	8 Y'ish.	do.	—	—	2	5.0	+	Corr.	.019	.750	56.7	117	210	297	394	441	288
611	8 W. W.	Fair.	—	—	2	2.0	—	S. corr., gum.	.019	.745	57.9	147	99	117	201	297	142
625	8 S. Y. T.	Good	—	—	2	4.0	+	Corr., gum.	.012	.748	57.2	151	217	257	343	403	266
668	8 Y'ish.	do.	—	—	2	4.5	—	Gum.	.008	.749	56.9	149	103	125	173	206	130
667	8 W. W.	do.	—	+	2	4.0	+	do.	.017	.750	56.7	165	103	190	175	213	270
789	8 S. Y.	do.	+	—	2	2.5	—	Corr., oil.	.081	.738	59.7	129	199	257	361	428	264
788	8 W. W.	do.	+	—	3	3.0	—	do.	.076	.738	59.7	129	203	257	365	424	268
799	8 S. Y. T.	Poor	—	+	2	1.5	—	do.	.086	.731	61.5	122	194	239	345	405	252
818	8 W. W.	Good	—	—	1	6.0	+	Gum.	.009	.751	56.4	140	210	257	340	408	262
839	8 W. W.	Fair.	—	—	3	1.0	—	Corr., gum, oil.	.058	.746	57.7	147	216	266	365	421	273
926	8 Y. T.	Good	—	—	1	3.0	+	Bad corr., gum.	.020	.748	57.2	122	203	261	365	421	266
937	8 Y. T.	do.	—	—	2	4.0	—	S. corr.	.007	.748	57.2	129	207	266	378	444	271
965	8 Y'ish.	Fair.	—	—	2	5.0	—	Corr., S. gum.	.015	.746	57.7	149	216	261	345	408	268
												65	102	127	174	209	131

964	8	Y'ish.....	Good.....	-	-	-	3	4.5	+	Corr., gum.....	.021	.748	57.2	145	217	262	345	406	266
278	9	W. W.....	Poor.....	+	-	-	2	1.0	-	Corr., S. gum.....	.015	.745	57.9	153	212	259	351	414	208
279	9	W. W.....	Good.....	+	-	-	5	2.0	-	do.....	.023	.746	57.7	145	208	255	372	437	130
280	9	W. W.....	do.....	+	-	-	3	.5	-	do.....	.019	.745	57.9	135	210	266	379	453	133
286	9	Y'ish.....	Poor.....	+	-	-	2	2.0	-	Corr., gum.....	.017	.746	57.7	135	201	248	354	417	201
524	9	S. Y.....	do.....	-	-	-	3	1.0	-	Corr.....	.027	.746	57.7	153	219	273	379	433	127
614	9	W. W.....	Fair.....	+	+	-	9	2.0	-	Tr. gum.....	.001	.747	57.4	135	207	259	387	444	204
615	9	W. W.....	do.....	-	-	-	3	4.0	-	S. corr., gum.....	.012	.747	57.4	127	212	268	378	448	275
642	9	W. W.....	Good.....	+	+	-	2	.5	-	S. corr.....	.012	.742	58.7	147	210	252	343	417	202
641	9	W. W.....	do.....	-	-	-	1	1.5	-	do.....	.018	.741	58.9	145	210	250	340	415	201
820	9	W. W.....	Poor.....	-	-	-	2	2.0	-	Corr., gum.....	.027	.747	57.4	135	208	253	360	439	206
840	9	S. Y.....	Good.....	-	-	-	2	1.0	+	Corr., oil.....	.067	.747	57.4	158	223	275	374	432	280
850	9	Y'ish.....	do.....	-	-	-	2	1.5	-	Oil, corr.....	.034	.746	57.7	138	208	268	374	415	273
970	9	Y'ish.....	do.....	-	-	-	3	1.5	-	Corr.....	.027	.748	57.2	154	223	282	385	448	288
976	9	Y'ish.....	do.....	-	-	-	1	3.5	-	Gum, S. corr.....	.016	.733	61.0	118	185	232	333	397	142
977	9	Y'ish.....	do.....	-	-	-	2	1.0	+	Corr., gum.....	.026	.745	57.9	118	196	250	354	421	257
986	9	W. W.....	do.....	-	-	-	2	2.0	-	do.....	.006	.746	57.7	115	212	266	381	452	270
985	9	Y'ish.....	do.....	-	-	-	1	3.5	-	Gum.....	.017	.747	57.4	129	203	243	334	403	253
995	9	W. W.....	Fair.....	+	-	-	3	2.5	-	Gum, corr.....	.028	.747	57.4	136	210	268	374	433	275
1006	9	Y'ish.....	Good.....	-	-	-	2	2.0	±	do.....	.030	.745	57.9	140	210	261	369	430	271
317	10	Y'ish.....	Poor.....	-	-	-	3	3.0	-	do.....	.014	.762	53.7	118	208	288	408	457	291
331	10	W. W.....	Good.....	-	-	-	3	6.5	+	Oil.....	.038	.759	54.5	111	212	261	419	439	289
330	10	S. Y. T.....	do.....	-	-	-	2	3.5	-	do.....	.015	.759	54.5	133	203	262	410	475	286
329	10	Y'ish.....	do.....	+	±	-	2	3.0	-	do.....	.362	.760	54.2	111	219	302	426	446	298
322	10	Y'ish.....	Poor.....	-	-	-	2	6.0	+	do.....	.056	.757	54.9	118	208	275	399	459	284
323	10	Y'ish.....	do.....	-	-	-	1	5.0	+	S. gum.....	.015	.726	62.8	108	167	210	315	381	223
														42	75	99	157	194	106

TABLE 16.—Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies—(Continued).

LARGE REFINERS AND MARKETERS—Continued.

Sam- ple No.	Com- pany No.	Color.	Odor.	Acidity.			Unsat- uration (per cent).	Doctor test.	Corrosion and gumming test.		Gravity.		Selected distillation results.					Aver- age boil- ing point.
				Methyl orange.	Litmus paper.	Phenol- phthal- ein (drops).			Nature of residue.	Weight of residue (grams).	Specific gravity.	°B.	Initial boil- ing point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	
336	10	Y'ish.....	Poor.....	—	—	2	7.5	—	Corr., gum.....	.049	.760	54.2	131	214	275	379	421	279
335	10	Y'ish.....	do.....	—	—	3	7.0	—	S. corr., gum.....	.072	.760	54.2	136	214	279	378	218	137
400	10	Y'ish.....	Fair.....	—	—	1	2.0	—	Corr., gum.....	.017	.755	55.4	122	201	232	293	221	138
399	10	W. W.....	do.....	+	—	6	6.0	+	Gum, oil.....	.149	.755	55.4	118	208	282	410	178	113
652	10	S. Y. T.....	Poor.....	—	—	1	4.0	—	Oil.....	.046	.773	51.1	135	203	282	423	478	288
651	10	Y. T.....	Good.....	—	—	1	3.0	—	Gum, oil.....	.017	.770	51.8	118	199	279	428	217	144
657	10	W. W.....	Poor.....	+	±	3	6.0	—	Tr. gum.....	.007	.752	56.2	138	205	270	405	249	289
695	10	S. Y.....	do.....	—	±	2	8.0	—	Gum.....	.025	.749	56.9	113	216	279	383	215	140
1011	10	Y'ish.....	do.....	—	—	2	7.0	—	Oil, gum.....	.053	.756	55.2	117	208	275	405	294	138
1010	10	Y'ish.....	Good.....	—	—	1	6.0	—	Gum.....	.013	.755	55.4	113	192	279	415	462	284
1009	10	Y'ish.....	Poor.....	—	—	2	8.0	+	Oil.....	.067	.756	55.2	120	212	282	406	239	140
1008	10	Y'ish.....	do.....	—	—	2	11.0	+	S. corr., gum.....	.020	.752	56.2	122	210	282	401	232	286
361	11	L. B.....	Fair.....	—	—	1	2.0	+	Oil.....	.037	.735	60.5	147	208	253	356	223	139
477	11	W. W.....	Poor.....	—	—	2	2.0	—	Bad corr., oil.....	.051	.747	57.4	113	216	273	369	414	268
491	11	W. W.....	Good.....	+	+	4	1.0	—	Corr., gum.....	.034	.744	58.2	163	225	270	347	417	273
679	11	Y'ish.....	Bad.....	+	—	3	3.0	+	Oil.....	.015	.737	60.0	140	201	250	349	435	261
686	11	Y'ish.....	Good.....	—	—	1	4.0	+	Corr., gum.....	.014	.730	61.8	131	203	239	342	428	253
704	11	O. K.....	O. K.....	—	—	2	2.5	—	.....	.....	.739	59.4	151	214	257	372	421	270
770	11	Y'ish.....	Poor.....	—	—	2	1.0	+	Bad corr.....	.013	.751	56.4	147	217	271	370	428	279
771	11	S. Y. T.....	.....	—	—	2	2.0	+	Corr., oil.....	.014	.734	60.7	120	169	208	307	396	223
													49	76	98	153	202	106

772	11	S. Y. T...	Good.....	—	—	—	3	3.5	+	Gum.....	.011	.720	64.4	127	203	244	336	392	252
816	11	Y'ish....	Poor.....	—	—	—	2	10.0	—	do	.028	.752	56.2	115	223	284	403	453	122
837	11	S. Y.....	Fair.....	+	+	—	3	1.0	—	Corr., gum, oil	.055	.746	57.7	46	106	140	206	234	289
879	11	Y'ish....	Poor.....	+	+	—	4	3.0	+	Oil.....	.032	.749	56.9	62	119	135	190	223	138
900	11	Y'ish....	Fair.....	+	+	—	10	4.0	+	do	1.520	.733	61.0	50	88	121	229	261	151
912	11	O. K.....	O. K.....	—	—	—	—	3.0	—	Corr.....	.018	.748	57.2	129	203	246	336	387	136
916	11	W. W....	Good.....	—	—	—	—	3.5	—	do	.018	.744	58.2	54	95	119	169	197	252
917	11	O. K.....	O. K.....	—	—	—	—	3.5	—	Corr., gum	.027	.742	58.7	56	94	117	164	197	248
947	11	Y'ish....	Bad.....	—	—	—	2	2.0	—	Bad corr.	.025	.747	57.4	136	228	282	372	435	286
258	12	W. W....	Good.....	—	—	—	1	7.0	—	Bad corr., gum	.046	.743	58.4	129	207	266	372	428	271
259	12	Y'ish....	Fair.....	—	—	—	1	4.0	—	Bad corr.	.117	.747	57.4	129	216	275	387	448	180
265	12	W. W....	do.....	—	—	—	1	8.0	+	S. corr., gum	.009	.748	57.2	129	228	275	365	419	279
268	12	Y'ish....	Poor.....	—	—	±	2	6.0	+	do	.017	.749	56.9	124	228	284	365	421	137
366	12	O. K.....	O. K.....	—	—	—	—	6.0	—	Corr.....	.047	.749	56.9	122	217	271	363	419	273
367	12	O. K.....	do.....	—	—	—	—	6.5	—	Corr., gum	.032	.754	55.7	129	230	279	374	411	282
373	12	S. Y.....	Good.....	—	—	±	1	7.0	—	Bad corr., oil	.389	.748	57.2	48	98	131	192	232	133
372	12	L. B....	Fair.....	—	—	±	1	6.0	—	Bad corr., gum	.032	.740	59.2	118	198	266	370	424	264
379	12	S. Y.....	do.....	—	—	±	1	6.0	+	Corr., gum	.021	.753	55.9	124	223	277	363	423	277
378	12	S. Y.....	do.....	—	—	±	1	7.0	—	Gum.....	.019	.749	56.9	122	225	280	367	428	279
385	12	S. Y.....	Poor.....	—	—	±	2	6.0	—	Bad corr., gum	.056	.744	58.2	131	210	270	356	426	271
391	12	Y'ish....	Fair.....	—	—	—	1	2.0	+	Bad corr.	.044	.745	57.9	129	210	273	385	453	279
396	12	Y. T....	Good.....	—	—	—	1	6.0	+	Corr., oil	.016	.750	56.7	53	99	134	196	231	137
395	12	Y'ish....	Poor.....	—	—	—	2	7.0	—	Gum.....	.010	.738	59.7	140	232	282	367	419	282
505	12	W. W....	Good.....	—	—	+	2	7.0	—	Corr., gum	.042	.741	58.9	60	111	139	186	215	139
608	12	Y'ish....	Fair.....	—	—	±	1	4.0	—	Gum.....	.013	.743	58.4	140	232	280	367	419	284
609	12	Y'ish....	Good.....	—	—	±	1	4.0	—	S. gum.....	.013	.743	58.4	60	111	138	186	215	140
														140	190	252	360	415	262
														109	212	277	376	432	217
														43	100	136	191	222	136
														221	270	354	412	273	134
														105	132	179	211		

TABLE 16.—Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies—Continued.

LARGE REFINERS AND MARKETERS—Continued.

Sample No.	Company No.	Color.	Odor.	Acidity.			Unsaturation (per cent).	Docolor test.	Corrosion and gumming test.		(Gravity.		Selected distillation results.				Average boiling point.
				Methyl orange.	Litmus paper.	Phenolphthalein (drops).			Nature of residue.	Weight of residue (grams).	Specific gravity.	Sp. B.	Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	
271	13	S. Y. T.	Fair.	—	—	—	3	0.5	Gum.	0.013	0.762	55.7	140	203	211	309	244
292	13	W. W.	do.	—	—	—	1	2.0	S. Corr.	.012	.754	55.7	135	45	116	154	118
293	13	S. Y.	Good.	—	—	—	2	0.5	Gum.	.013	.753	55.9	117	98	116	154	246
304	13	S. Y. T.	Poor.	—	—	—	3	2.0	S. corr., gum.	.007	.764	53.2	47	46	118	191	119
205	13	Y'ish.	Good.	—	—	—	2	0.5	Corr., gum.	.007	.765	53.0	57	46	119	150	117
308	13	Yellow.	Poor.	—	±	—	1	2.0	Gum.	.014	.756	55.2	129	94	112	149	116
312	13	W. W.	Good.	—	—	—	1	1.0	S. corr., oil.	.007	.755	55.4	144	94	118	157	118
862	13	Y'ish.	Bad.	—	±	—	2	1.0	Tr. gum.	.007	.755	55.4	117	203	244	329	244
861	13	Y'ish.	Poor.	—	±	—	2	2.0	do.	.013	.754	55.7	113	205	241	320	246
1044	13	Yellow.	do.	—	±	—	2	2.0	Corr., gum.	.015	.755	55.4	127	201	230	316	119
1045	13	Yellow.	do.	—	±	—	2	1.5	Gum.	.001	.755	55.4	131	203	241	316	118
1046	13	W. W.	do.	—	±	—	1	2.0	Oil.	.328	.755	55.4	131	205	244	324	119
1053	13	Y'ish.	do.	—	—	—	2	2.5	do.	.064	.769	52.1	133	207	246	324	122
1054	13	Y'ish.	do.	—	—	—	1	1.5	Corr., gum.	.008	.773	51.1	140	208	246	325	122
1055	13	Y'ish.	do.	—	—	—	2	0.5	C, corr., gum.	.007	.769	52.1	149	212	250	331	123
270	14	Y'ish.	do.	—	—	—	1	2.5	Oil.	.064	.766	52.8	118	203	244	388	126
275	14	Y'ish.	do.	—	—	—	2	1.0	Gum.	.018	.765	53.0	135	201	244	325	261
297	14	S. Y.	Good.	—	—	—	2	2.5	Corr., gum.	.015	.756	55.1	120	203	248	327	211
307	14	Y'ish.	do.	—	—	—	4	0.5	S. corr., gum.	.008	.759	54.5	120	194	237	338	252
306	14	S. Y. T.	Poor.	—	—	—	4	1.5	do.	.010	.762	53.7	136	201	246	394	119
													58	94	119	168	253

309	14	S. Y.	do.....	-	±	3	6.0	+	Corr., gum.....	.021	.750	55.7	113	192	237	331	339	262
315	14	W. W.	Good.....	-	-	1	2.0	-	S. corr., gum.....	.024	.678	76.5	86	113	114	166	204	128
314	14	Y'ish.	Fair.....	-	-	1	2.0	-	do.....	.015	.752	56.2	118	203	248	284	140	169
313	14	W. W.	Good.....	-	-	1	2.0	-	Corr., gum.....	.009	.750	56.7	118	194	241	334	401	253
316	14	W. W.	do.....	-	-	1	0.5	-	do.....	.....	.710	67.2	88	113	154	286	200	245
401	14	W. W.	Fair.....	+	±	4	2.0	-	Corr., s. gum.....	.020	.755	55.4	127	219	273	381	433	141
894	14	Y'ish.	Bad.....	+	±	3	2.0	-	Corr., oily gum.....	.040	.749	59.9	106	194	241	320	388	277
863	14	Y'ish.	do.....	-	±	2	2.0	+	Corr., gum.....	.018	.752	56.2	122	194	239	325	390	244
1050	14	L. B.	Poor.....	-	±	1	2.5	+	Gum.....	.019	.751	56.4	109	189	234	324	379	118
1049	14	Y'ish.	do.....	-	±	2	2.0	+	Corr., gum.....	.020	.752	56.2	117	198	241	329	394	248
1048	14	Yellow	do.....	-	±	3	2.0	-	do.....	.037	.793	46.5	163	257	320	423	460	318
1047	14	Y'ish.	do.....	-	±	2	2.5	+	do.....	.019	.750	56.7	108	196	241	331	390	159
277	15	W. W.	Fair.....	+	±	4	5.0	-	Corr., gum, oil.....	.067	.748	57.2	106	225	306	394	437	246
282	15	W. W.	do.....	+	±	2	6.0	-	Gum, oil.....	.056	.738	59.7	97	194	311	414	437	119
283	15	S. Y.	do.....	+	±	3	5.0	-	S. corr., gum, oil.....	.082	.736	60.2	95	185	238	414	424	144
825	15	W. W.	Good.....	-	±	1	5.5	-	Corr., oil.....	.066	.740	59.2	29	102	150	215	222	139
848	15	S. Y.	Fair.....	-	±	4	5.0	-	do.....	.050	.741	58.9	108	221	315	415	444	289
969	15	Y'ish.	do.....	+	±	3	5.0	-	S. corr., gum.....	.026	.738	59.7	138	198	244	340	397	280
974	15	S. Y.	Poor.....	-	-	1	2.5	+	Corr., gum.....	.028	.756	55.2	122	217	266	356	406	253
973	15	Y'ish.	Good.....	-	±	1	3.0	+	S. gum.....	.019	.753	55.9	120	205	255	347	401	268
981	15	W. W.	do.....	-	±	2	6.0	+	Corr., oil.....	.043	.743	58.4	113	190	271	383	433	126
994	15	Y'ish.	Fair.....	+	±	3	5.0	-	Corr., gum.....	.024	.738	59.7	136	196	241	338	399	271
998	15	Y'ish.	Poor.....	-	±	2	2.5	+	S. corr., gum.....	.019	.752	56.2	131	214	261	372	428	252
1003	15	S. Y.	Good.....	-	-	2	5.5	-	Bad corr., gum.....	.030	.742	58.7	118	207	252	352	412	131
291	16	Y'ish.	do.....	-	-	1	0.5	-	Gum.....	.040	.796	45.9	219	279	307	374	433	315
290	16	Y'ish.	Fair.....	-	-	1	1.0	-	S. corr., gum.....	.024	.703	53.5	133	221	261	340	392	265
				-	-								56	105	127	171	200	130

TABLE 16.—Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies—Continued.

LARGE REFINERS AND MARKETERS—Continued.

Sample No.	Company No.	Color.	Odor.	Acidity.		Unsaturation (per cent).	Doctor test.	Corrosion and gumming test.		Gravity.	Selected distillation results.					Average boiling-point.
				Methyl litmus orange paper.	Phenolphthalein (drops).			Nature of residue.	Weight of residue (grams).		Initial boiling-point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	
303	16	S. Y. T.	Good.	—	2	1.0	—	Corr., oil.	0.014	0.770	51.8	124	212	261	334	259
302	16	S. Y. T.	Poor.	—	3	2.0	—	Corr., gum.	.007	.763	53.5	111	210	252	315	198
311	16	Y'ish.	Good.	—	1	1.0	—	do.	.033	.763	53.5	131	223	262	331	192
859	16	Y'ish.	Poor.	—	1	2.0	—	Gum.	.021	.756	55.2	111	196	232	313	255
860	16	Y'ish.	do.	—	2	2.0	—	Corr., gum.	.051	.750	56.7	117	196	253	332	257
1043	16	S. Y.	do.	+	1	2.0	—	do.	.029	.762	53.7	126	216	261	342	262
1042	16	S. Y.	do.	—	2	1.5	—	do.	.017	.762	53.7	129	216	261	338	262
1052	16	Y'ish.	do.	—	2	1.5	—	do.	.014	.773	51.1	130	221	262	334	264
1051	16	Y'ish.	Good.	—	4	1.5	—	S. corr., gum.	.016	.768	52.3	131	221	264	331	262
288	17	W. W.	Poor.	+	2	5.0	—	S. corr., S. gum.	.015	.750	56.7	135	217	262	361	273
500	17	W. W.	Good.	—	1	4.0	+	Gum.	.031	.744	58.2	133	219	275	381	280
510	17	S. Y.	Poor.	—	1	5.0	+	Oil.	.015	.748	57.2	126	221	280	365	279
511	17	S. Y.	Good.	—	1	5.0	+	S. gum.	.008	.748	57.2	131	221	266	363	275
517	17	S. Y.	Fair.	—	2	5.0	—	Gum.	.029	.752	56.2	149	212	261	361	275
525	17	Y. T.	Good.	—	—	6.0	+	S. corr., gum.	.024	.749	56.9	144	225	282	372	284
952	17	Y'ish.	Poor.	+	1	10.0	+	Gum.	.012	.746	57.7	122	221	279	374	279
951	17	Y'ish.	do.	+	2	8.0	—	Corr., gum.	.021	.749	56.9	118	217	280	371	279
957	17	Y'ish.	Fair.	—	1	2.0	—	do.	.027	.745	57.9	106	208	280	394	280
958	17	W. W.	Good.	—	1	8.0	—	S. corr., gum.	.020	.754	55.7	122	212	280	372	282
967	17	Y'ish.	do.	—	2	9.0	—	do.	.017	.752	56.2	118	219	286	388	284
												43	104	141	198	225

965	17	W. W.	do.	-	-	4	9.0	-	do.	.023	.751	56.4	118	225	291	396	441	289
352	18	S. Y.	Poor.	-	-	1	4.0	+	do.	.023	.752	56.2	131	107	144	383	451	143
351	18	W. W.	Good.	-	-	1	2.0	-	S. gum.	.010	.728	62.3	55	105	252	395	461	284
359	18	L. B.	Poor.	-	-	1	4.0	+	S. corr., gum.	.023	.745	57.9	167	194	102	128	327	223
541	18	W. W.	Fair.	-	-	1	4.0	+	Corr., gum.	.019	.754	55.7	117	194	257	358	426	261
865	18	S. Y.	Good.	-	-	2	5.0	+	do.	.012	.745	57.9	145	210	279	351	423	266
869	18	W. W.	do.	+	-	1	4.0	+	Oil.	.031	.720	64.4	63	99	126	177	217	130
878	18	Y'ish.	Fair.	-	-	1	5.0	+	Corr., oily gum.	.027	.746	57.7	102	162	207	342	399	225
884	18	Y'ish.	Good.	-	-	2	3.0	-	Oil.	.380	.742	58.8	39	72	97	172	204	107
885	18	Y'ish.	Benzol.	-	-	1	0.5	+	Oil, gum.	.033	.706	68.3	118	212	277	381	451	279
899	18	W. W.	Fair.	+	-	3	8.0	+	Corr., gum.	.029	.752	56.2	111	216	298	396	460	291
289	19	W. W.	Good.	-	-	1	2.0	-	Gum.	.017	.748	57.2	113	108	206	370	424	268
301	19	Y'ish.	do.	-	-	2	1.0	-	Corr., gum.	.009	.761	54.0	45	92	130	188	218	131
300	19	Y'ish.	do.	-	-	2	0.5	-	Gum, S. corr.	.015	.805	43.9	124	208	270	376	439	273
299	19	Y'ish.	do.	-	-	4	0.5	-	Gum, corr.	.009	.766	52.8	51	98	132	191	226	134
310	19	W. W.	do.	-	-	1	.....	.....	Gum.	.023	.790	47.2	113	100	230	315	392	237
856	19	Y'ish.	Bad.	-	-	1	2.0	+	Gum, S. corr.	.016	.751	56.4	45	88	110	157	200	114
858	19	Y'ish.	do.	-	-	2	1.0	-	Corr., S. gum.	.015	.753	55.9	131	194	234	313	388	241
857	19	Y'ish.	Bad.	-	-	2	2.0	-	Corr., S. gum.	.041	.749	56.9	55	90	112	156	198	116
362	20	L. B.	Poor.	-	-	1	4.0	+	do.	.014	.739	59.4	212	277	307	388	439	316
691	20	Y'ish.	Good.	-	-	1	7.0	+	Oily gum.	.016	.744	58.2	100	136	156	198	246	329
706	20	O. K.	O. K.	-	-	2	4.5	-	do.	.014	.739	59.4	131	201	246	329	390	252
804	20	W. W.	Good.	+	+	2	1.5	-	do.	.014	.739	59.4	104	194	229	309	409	309
805	20	W. W.	do.	-	-	1	1.0	-	do.	.014	.739	59.4	104	194	229	309	409	309
1063	20	W. W.	Fair.	-	-	1	2.0	-	do.	.014	.739	59.4	104	194	229	309	409	309
1064	20	S. Y.	do.	-	-	1	3.0	-	do.	.010	.733	61.0	111	194	225	320	392	241

TABLE 16.—Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies—Continued.

LARGE REFINERS AND MARKETERS—Continued.

Sam- ple No.	Com- pany No.	Color.	Odor.	Acidity.			Unsat- uration (per cent).	Doctor test.	Corrosion and gumming test.		Gravity.		Selected distillation results.					Aver- age boil- ing point.
				Methyl orange.	Litmus paper.	Phenol- phthal- ein (drops).			Nature of residue.	Weight of residue (grams).	Specific gravity.	°B.	Initial boil- ing point.	20 per cent. mark.	50 per cent. mark.	90 per cent. mark.	Dry point.	
358	21	S. Y.	Fair	—	—	1	8.0	—	Corr.	0.023	0.738	59.7	{ 122 50 }	208	266	360	414	266
529	21	Y'ish.	Poor	—	—	1	7.0	—	Corr., gum.	.024	.739	59.4	{ 126 52 }	214	180	360	408	180
537	21	Y'ish.	do.	—	—	2	7.0	—	Corr., oil.	.035	.743	58.4	{ 129 54 }	219	182	363	414	270
554	21	W. W.	do.	—	—	2	4.0	—	Corr.	.028	.744	58.2	{ 124 51 }	216	142	352	399	275
729	21	O. K.	O. K.	+	+	.....	5.5	—	do.	.032	.736	60.2	{ 117 47 }	102	132	178	204	131
748	21	Y. T.	Good	—	—	2	6.0	—	S. corr., gum.	.021	.743	58.4	{ 111 44 }	203	255	312	394	257
800	22	Y. T.	Poor	—	+	2	8.5	—	Corr.	.007	.754	55.7	{ 111 44 }	208	270	374	426	128
808	22	Y'ish.	do.	—	+	2	10.0	—	Gum.	.026	.741	58.9	{ 99 37 }	202	190	337	414	133
781	22	S. Y. T.	do.	—	+	2	1.0	+	Corr., gum.	.015	.746	57.7	{ 117 49 }	196	186	356	428	261
814	22	Y'ish.	do.	—	—	2	11.5	—	do.	.020	.750	56.7	{ 97 37 }	214	173	360	410	268
792	22	S. Y.	do.	—	—	2	11.0	+	do.	.007	.760	54.2	{ 93 34 }	211	134	182	210	131
662	23	B.	do.	+	+	2	8.0	+	Corr., oil.	.039	.751	56.4	{ 99 37 }	180	286	406	430	275
672	23	Y'ish.	Fair	—	—	2	5.5	—	Gum, oil.	.040	.753	55.9	{ 99 37 }	207	137	307	457	248

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321	25	W. W.	Poor	—	—	3	1.0	+	Corr., oil.	0.035	0.751	56.4	{ 136 58 }	219	275	381	444	282
833	26	Y'ish.	do.	+	—	5	2.0	—	do.	.141	.741	58.9	{ 109 43 }	167	233	411	483	137

834	26	Y'ish.	Poor.	—	1	3.0	—	.024	.749	56.9	136	210	268	390	435	277
886	27	Y'ish.	Poor.	—	1	2.0	—	.040	.744	58.2	104	212	284	199	224	136
887	27	Y'ish.	Good.	—	1	3.0	+	.035	.720	64.4	82	149	250	309	226	280
819	28	Y'ish.	Poor.	—	3	1.0	—	.034	.741	58.9	136	217	275	270	215	252
520	28	Brown	do.	—	3	1.0	—	.022	.740	59.2	136	219	279	378	423	270
512	28	S.Y.	Good.	—	1	2.0	—	.013	.745	57.9	134	230	279	374	419	288
742	29	W.W.	Fair.	—	.....	5.0	+	.017	.755	55.4	138	230	282	369	433	286
835	30	Y'ish.	Poor.	—	3	1.0	—	.033	.752	56.2	135	214	280	392	437	286
846	32	Y'ish.	Good.	—	2	8.5	+	.040	.745	57.9	113	212	284	405	433	282
845	33	Y'ish.	do.	—	2	1.5	+	.027	.747	57.4	131	205	248	356	424	261
465	34	S.Y.	Poor.	—	2	4.0	—	.037	.750	56.7	153	219	270	370	437	279
664	34	W.W.	Good.	+	1	2.0	—	.020	.744	58.2	133	196	243	388	225	137
870	35	W.W.	do.	—	1	0.5	—	.007	.713	66.4	118	172	207	271	168	198
871	36	W.W.	Poor.	—	1	1.0	—	.022	.712	66.6	122	169	198	270	162	100
353	37	S.Y.	Good.	—	1	6.0	—	.011	.740	59.2	153	226	257	329	185	99
873	38	W.W.	do.	—	1	1.0	—	Tr. corr.	.710	67.2	122	169	198	262	194	129
872	38	W.W.	do.	—	1	0.5	—	do.	.734	60.7	158	210	235	293	158	96
1070	39	Y.T.	do.	—	2	3.0	±	.088	.710	67.2	70	99	113	145	175	116
513	40	W.W.	Fair.	—	1	2.0	—	.011	.740	59.2	131	198	255	376	432	248
492	44	W.W.	Poor.	—	3	1.5	—	.015	.752	56.2	154	223	275	381	226	131
475	45	W.W.	do.	+	3	1.0	—	.010	.746	57.7	140	205	261	388	228	140
993	47	W.W.	Bad.	+	2	2.0	—	.043	.749	57.1	147	207	263	356	410	284
1002	47	Y'ish.	Poor.	—	2	1.0	—	.017	.739	59.4	126	180	246	361	432	257
455	48	Y'ish.	do.	—	1	1.0	—	Tr. corr.	.744	58.2	133	212	255	343	397	262
456	48	S.Y.T.	Good.	+	2	2.0	+	.013	.746	57.8	131	210	261	351	423	266
457	48	Y'ish.	do.	—	1	3.0	—	.018	.714	66.1	104	160	207	302	380	217
				—	.....	.....	—	.....	.....	.....	40	71	97	150	199	103

TABLE 16. Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies—Continued.

SMALL REFINERS—Continued.

Sam- ple No.	Com- pany No.	Color.	Odor.	Acidity.		Unsat- uration (per cent).	Poctor test.	Corrosion and gumming test.		Gravity.		Selected distillation results.					Aver- age boil- ing point.
				Methyl orange.	Phenol litmus paper. (drops).			Nature of residue.	Weight of residue (grams).	Specific gravity.	°B.	Initial boil- ing point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	
423	48	Y'ish.....	Very poor.....	—	—	1	+	Gum.....	0.005	0.744	58.3	129	214	259	317	412	266
424	48	Y. T.....	Good.....	—	—	1	+	Tr. corr.....		.745	58.1	140	210	255	315	410	130
425	48	Y'ish.....	Poor.....	—	—	1	—	do.....		.712	66.6	104	158	207	302	210	264
613	48	Y'ish.....	do.....	—	—	2	+	do.....		.744	58.2	142	217	261	365	435	100
874	49	Y'ish.....	Good.....	—	—	1	—	Tr. corr.....		.708	67.7	122	171	203	264	329	133
618	52	Y'ish.....	do.....	—	—	3	+	S. corr., gum.....	.017	.746	57.7	138	212	268	379	433	98
619	52	W. W.....	do.....	—	—	1	+	Corr., gum.....	.015	.744	58.2	131	208	270	378	417	273
620	53	W. W.....	Poor.....	—	—	2	—	S. corr., gum.....	.009	.746	57.7	169	217	255	334	388	134
478	55	Bloom.....	do.....	+	—	2	—	Oil.....	.083	.738	59.7	118	190	252	379	435	262
516	56	S. Y.....	Fair.....	—	—	1	—	Gum.....	.031	.746	57.7	120	203	259	372	433	128
522	57	W. W.....	Poor.....	—	—	3	—	do.....	.021	.746	57.7	174	226	270	351	403	132
523	57	S. Y.....	Fair.....	—	—	3	—	Corr.....	.008	.747	57.4	171	228	271	354	414	277
263	57	W. W.....	do.....	—	—	1	—	Gum.....	.023	.741	58.9	130	230	282	361	415	137
929	58	W. W.....	Poor.....	—	—	1	+	Oil.....	.005	.757	54.9	135	210	259	354	415	266
337	59	S. Y. T.....	Good.....	—	—	3	—	Bad corr., gum.....	.033	.755	55.4	151	239	295	379	433	130
338	59	S. Y. T.....	do.....	—	—	4	—	do.....	.030	.745	57.9	133	221	270	356	406	146
479	59	S. Y. T.....	do.....	—	—	4	—	Corr., oil, gum.....	.036	.745	57.9	144	223	271	352	410	134
621	59	S. Y. T.....	do.....	—	—	2	—	Corr., gum.....	.031	.745	57.9	115	225	286	390	424	286
622	59	S. Y. T.....	do.....	—	—	3	—	do.....	.022	.745	57.9	151	225	273	356	417	141
633	59	W. W.....	do.....	+	—	2	+	Corr., oil.....	.022	.751	56.4	133	226	275	365	419	279
												56	108	135	185	215	137

654	60	Y'ish.....	Fair.....	+	-	3	4.0	-	Gum.....	.015	.763	53.5	122	201	266	437	452	298
1101	60	Y'ish.....	Bad.....	-	-	1	4.0	±	do.....	.014	.756	55.2	122	207	280	225	250	148
1102	60	Y'ish.....	do.....	-	-	2	8.0	±	Oily gum.....	.044	.756	55.2	111	207	311	216	249	288
1103	60	Y'ish.....	do.....	-	-	2	9.0	±	Peac.....	.001	3.75	55.9	44	97	155	218	246	300
1104	60	Y'ish.....	Fair.....	+	-	4	6.0	-	Tr. gum.....	.001	.754	55.7	108	210	284	397	468	286
893	61	Y'ish.....	Good.....	-	-	1	2.0	-	S. corr., oil.....	.021	.710	67.2	93	131	210	246	246	284
894	61	Y'ish.....	do.....	-	+	1	2.0	-	Oil.....	.012	.732	61.3	158	224	307	415	237	237
827	62	Y'ish.....	do.....	+	-	2	2.0	+	Gum.....	.032	.746	57.7	144	201	243	327	381	130
826	62	W. W.....	Poor.....	-	-	1	5.0	+	do.....	.019	.745	57.9	133	212	248	333	392	259
849	62	Y'ish.....	Good.....	-	-	2	5.5	-	Bad corr., gum.....	.027	.743	58.4	117	198	257	367	421	262
623	63	W. W.....	do.....	+	-	1	1.0	+	S. corr., gum.....	.015	.737	60.0	140	198	233	329	360	250
624	63	W. W.....	Poor.....	-	-	1	2.0	+	do.....	.013	.751	56.4	169	210	266	365	426	273
975	64	L. B.....	Good.....	-	-	1	2.0	+	Gum.....	.025	.745	57.9	131	187	239	336	415	255
982	64	Y'ish.....	Bad.....	+	+	3	2.0	-	do.....	.008	.745	57.9	145	207	257	370	437	271
1005	64	Y'ish.....	Good.....	-	-	2	1.5	-	S. corr., gum.....	.009	.744	58.2	126	194	244	367	419	261
264	65	W. W.....	do.....	-	-	2	6.0	-	Bad corr., gum.....	.051	.750	56.7	118	212	280	387	429	280
983	66	W. W.....	do.....	-	-	1	2.5	-	S. corr., gum.....	.014	.742	58.7	131	198	248	378	448	266
588	67	S. V.....	Poor.....	-	-	2	3.0	+	Gum.....	.008	.740	59.2	115	201	271	356	414	262
780	67	Y'ish.....	Good.....	-	-	1	2.0	+	Corr., gum.....	.012	.737	60.0	46	94	127	180	212	128
812	67	Y'ish.....	Poor.....	+	-	2	4.0	+	do.....	.011	.740	59.2	111	207	266	365	424	270
876	68	Y'ish.....	do.....	-	-	1	2.0	-	Tr. corr.....	.006	.706	68.3	118	167	201	266	356	210
877	68	Y'ish.....	do.....	+	+	3	22.0	+	Hard gum.....	.064	.750	56.7	167	210	241	311	361	99
855	69	Y'ish.....	Good.....	-	-	2	1.0	-	Gum.....	.011	.736	60.2	133	196	235	327	385	121
851	69	Y'ish.....	do.....	-	-	2	2.0	-	Corr., gum.....	.010	.736	60.2	133	196	243	331	385	246
978	71	Y'ish.....	Fair.....	-	-	6	1.5	-	Bad corr., gum.....	.045	.749	56.9	131	198	246	334	387	119
996	71	Y'ish.....	do.....	+	-	3	2.0	-	Corr., gum.....	.029	.750	56.7	144	207	250	338	394	250
													62	97	121	170	201	125

591	82	W. W.	Poor	+	-	3	3.5	+	Oil	.016	.735	60.5	135	203	244	338	448	259
598	83	Y'ish.	Good	-	-	2	2.0	-	Gum	.051	.722	.639	149	201	239	306	244	125
1085	83	Y'ish.	Poor	-	-	2	2.5	-	S. corr.	.007	.745	57.9	126	201	261	370	268	118
1086	83	W. W.	Sweet	-	-	1	.5	-	Tt. corr.		.723	63.6	118	181	214	288	363	223
1087	83	W. W.	Good	-	-	1	.5	-	do.		.710	67.2	120	171	205	270	331	210
295	84	S. Y.	do.	-	-	2	1.0	±	S. corr., oil	.600	.746	57.7	131	192	239	325	394	246
636	85	W. W.	do.	-	-	2	2.5	-	Corr., oil	.017	.745	57.9	149	207	253	343	405	262
637	85	Y'ish.	do.	-	-	2	1.0	-	S. corr., gum	.014	.726	62.8	129	180	214	302	370	226
897	87	Y'ish.	do.	-	+	1	2.0	-	Gum	.010	.728	62.3	83	198	232	360	403	261
898	87	Y'ish.	do.	-	-	1	1.0	-	do.	.007	.720	64.4	108	181	243	351	413	248
484	88	W. W.	Poor	-	-	3	1.0	-	Bad corr., gum	.034	.737	60.0	144	190	230	329	406	246
485	88	W. W.	Good	-	-	2	1.0	-	do.	.056	.750	56.7	147	205	271	392	442	277
496	88	Y'ish.	Fair	-	-	2	.5	-	Corr., gum	.031	.753	55.9	160	223	277	387	448	286
486	89	W. W.	Poor	+	-	2	1.5	-	do.	.045	.746	57.7	149	226	270	372	423	280
979	90	Y'ish.	Good	-	-	1	2.0	-	Oil, gum	.015	.750	56.7	118	205	273	379	421	275
294	92	Y'ish.	do.	-	-	3	1.5	-	S. corr., oil	.252	.771	51.6	127	219	264	340	403	266
688	251	Y'ish.	Benzol.	-	-	1	3.0	-	Corr.	.005	.852	34.3	169	189	201	248	358	130
889	251	Y'ish.	do.	-	-	1	2.0	-	Corr., gum	.035	.831	38.5	144	189	216	414	471	261
890	251	Y'ish.	Sweet	-	-	2	3.0	-	do.	.028	.713	66.4	90	144	223	388	421	237
546	252	Blue	Alh. and ether.	+	-	3	34.0	-	Oil after 10 hours	1.290	.816	41.6	132	133	160	419	507	235
716	253	S. Y.	Benzol.	-	-		14.0	-	Gum	.019	.805	43.9	167	187	210	349	415	246
296	256	S. Y.	Good	-	-	2	2.0	-	do.	.018	.760	54.2	124	205	244	340	405	255
616	258	W. W.	Fair	+	-	7	2.0	-	Corr.	.023	.750	56.7	144	221	270	369	466	280
828	258	W. W.	Poor	-	-	1	1.5	-	Corr., gum	.013	.748	57.2	149	208	262	352	414	270
													135	203	244	338	448	259
													149	201	239	306	244	125
													126	201	261	370	268	118
													118	181	214	288	363	223
													120	171	205	270	331	210
													131	192	239	325	394	246
													149	207	253	343	405	262
													129	180	214	302	370	226
													83	198	232	360	403	261
													108	181	243	351	413	248
													144	190	230	329	406	246
													147	205	271	392	442	277
													160	223	277	387	448	286
													149	226	270	372	423	280
													118	205	273	379	421	275
													127	219	264	340	403	266
													169	189	201	248	358	130
													144	189	216	414	471	261
													90	144	223	388	421	237
													132	133	160	419	507	235
													167	187	210	349	415	246
													124	205	244	340	405	255
													144	221	270	369	466	280
													149	208	262	352	414	270
													135	203	244	338	448	259

TABLE 16.—Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies—Continued.

JOBBERS.

Sample No.	Company No.	Color.	Odor.	Acidity.			Unsaturation (per cent).	Doctor test.	Corrosion and gumming test.		Gravity.		Selected distillation results.					Average boiling point.
				Methyl orange.	Litmus paper.	Phenolphthalein (drops).			Nature of residue.	Weight of residue (grams).	Specific gravity.	°B.	Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	
867	93	Y'ish.	Poor.	—	—	1	3.5	—	Oil.	0.199	0.730	61.8	{	91	228	307	401	419
868	93	Y'ish.	do.	—	—	1	2.5	—	do.	.167	.729	62.0	{	33	109	153	205	215
320	94	S. Y. T.	Good.	—	—	3	1.0	—	Corr., gum.	.020	.754	55.7	{	32	115	152	208	212
547	95	W. W.	Fair.	—	—	1	7.0	+	S. gum.	.011	.745	57.9	{	61	100	134	194	222
539	96	L. B.	do.	—	—	1	3.0	—	Peace, s. gum.	.011	.752	56.2	{	153	241	293	367	417
540	96	W. W.	Poor.	—	—	1	4.0	—	do.	.011	.753	55.9	{	67	116	145	186	214
638	99	W. W.	Bad.	—	—	1	1.0	+	S. corr., oil.	.020	.742	58.7	{	53	103	133	184	217
639	99	W. W.	do.	—	—	1	3.0	+	Corr., oil.	.015	.735	60.5	{	133	214	268	365	419
640	99	Y'ish.	Poor.	—	—	1	2.0	—	Corr., gum.	.008	.744	58.2	{	97	194	289	406	453
1074	101	Y'ish.	Bad.	+	+	3	9.5	+	Corr., oil.	.655	.756	55.2	{	36	90	143	208	234
1075	101	L. B.	Good.	+	—	2	3.0	—	S. corr., oil.	.024	.715	65.8	{	90	183	273	403	437
1076	101	W. W.	do.	—	—	1	4.0	—	do.	.061	.744	58.2	{	32	84	134	206	225
989	102	W. W.	Fair.	+	—	2	5.5	—	Corr., gum.	.034	.742	58.7	{	106	194	284	386	439
1088	103	W. W.	Poor.	—	—	2	2.0	—	S. corr., gum.	.007	.754	55.7	{	41	90	140	202	226
1089	103	W. W.	do.	—	—	1	1.0	—	Gum.	.005	.737	60.0	{	129	216	284	392	457
1090	103	W. W.	do.	—	—	1	1.5	—	S. corr., gum.	.010	.726	62.8	{	54	102	140	200	236
417	104	W. W.	Good.	—	+	2	2.0	+	do.	.072	.747	57.4	{	109	136	192	286	379
418	104	S. Y. T.	do.	—	—	1	1.5	—	do.	.102	.745	57.9	{	43	69	89	141	193
													{	138	199	250	370	433
													{	93	121	188	223	283
													{	109	205	243	345	421
													{	96	117	174	276	351
													{	111	196	264	383	444
													{	44	91	129	195	229
													{	120	192	248	363	430
													{	89	120	184	221	286
													{	115	180	221	313	387
													{	46	82	105	156	203
													{	126	207	270	410	482
													{	52	97	132	210	250
													{	102	194	270	408	477
													{	39	90	132	209	247

419	104	Y'ish.....	do.....	+	+	2	3.0	-	Oil.....	.051	.726	62.8	97	174	239	352	403	244
935	105	Y. T.....	Poor.....	-	-	1	3.0	+	Gum.....	.004	.715	(5.8	109	158	118	178	206	118
782	106	W. W.....	Fair.....	-	-	2	7.0	-	Corr., gum.....	.013	.782	49.0	145	192	253	390	442	273
783	106	W. W.....	do.....	-	-	2	7.5	-	do.....	.017	.782	49.0	120	192	257	383	432	268
709	107	Y'ish.....	Good.....	-	-	2	5.0	-	Oil.....	.041	.733	61.0	91	210	289	401	419	280
444	109	Y. T.....	Poor.....	-	-	1	2.0	-	S. corr.....	.018	.732	61.3	124	194	239	338	406	138
476	110	W. W.....	Good.....	-	-	3	2.0	+	S. corr., gum.....	.012	.740	59.2	145	212	259	343	394	264
464	111	S. Y.....	Fair.....	+	+	3	2.0	+	Corr., gum.....	.041	.752	56.2	118	234	298	417	489	302
793	113	W. W.....	Good.....	-	-	1	1.0	-	Corr.....	.014	.716	65.5	113	165	203	289	363	230
794	113	X. T.....	Poor.....	.....	.....	.....	1.0	-	do.....	.007	.742	58.7	120	214	262	358	432	268
630	115	Y'ish.....	Fair.....	+	+	3	2.0	±	S. corr.....	.009	.745	57.9	127	201	255	379	437	271
631	115	Y'ish.....	Good.....	+	+	4	2.0	±	Corr., gum.....	.021	.748	57.2	129	201	266	395	457	277
1037	116	W. W.....	Fair.....	-	-	2	4.0	-	Tr. ....	.....	.710	67.2	86	140	248	417	417	252
1038	116	W. W.....	Good.....	-	-	1	8.0	-	Corr., gum.....	.016	.745	57.9	129	223	291	381	441	289
785	118	W. W.....	Fair.....	-	-	2	3.0	-	Gum.....	.007	.745	57.9	135	208	261	365	432	272
824	120	L. B.....	Poor.....	-	-	1	6.5	+	do.....	.004	.746	57.7	145	214	253	336	392	261
836	120	W. W.....	Fair.....	-	-	3	2.5	-	Corr., gum.....	.017	.747	57.4	147	223	264	352	410	271
1012	121	Y'ish.....	do.....	-	-	3	8.0	+	S. corr., gum.....	.021	.753	55.9	113	214	286	405	448	288
324	122	S. Y. T.....	Good.....	-	-	2	1.0	-	Corr., s. gum.....	.017	.756	55.2	171	221	270	369	435	270
332	122	S. Y. T.....	do.....	+	+	4	1.0	-	Oil.....	.054	.743	58.4	111	185	246	397	451	266
503	123	Y'ish.....	Poor.....	+	+	3	8.5	-	Corr., gum.....	.026	.746	57.7	115	203	266	381	444	273
990	124	W. W.....	do.....	-	-	1	2.0	-	do.....	.013	.747	57.4	147	212	259	356	417	270
991	124	Y'ish.....	Fair.....	+	+	4	4.0	-	do.....	.024	.747	57.4	147	212	264	365	441	273
911	126	O. K.....	O. K.....	.....	.....	.....	2.0	-	do.....	.020	.742	58.7	126	199	243	325	383	246
1000	127	Y'ish.....	Poor.....	-	-	2	1.5	+	S. corr., gum.....	.044	.745	57.9	140	199	248	369	435	262
758	128	O. K.....	O. K.....	.....	.....	.....	3.5	-	Corr.....	.032	.753	55.9	111	199	262	358	412	251
				-	-	.....	.....	-					44	93	128	181	211	127

TABLE 16.—Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies—Continued.

JOBBER. Continued.

Sam- ple No.	Color.	Odor.	Acidity.			Unsat- uration (per cent).	Doctor test.	Corrosion and gumming test.		Gravity.		Selected distillation results.					Aver- age boil- ing point.
			Methyl orange.	Litmus paper.	Phenol- phthal- ein (drops).			Nature of residue.	Weight of residue (grams).	Specific gravity.	°B.	Initial boil- ing point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	
902	W. W.	Fair	—	—	1	5.0	—	Corr., gum.	0.021	0.747	57.4	{ 99 37	176 80	244 118	379 193	419 215	252 122
1079	Y'ish.	Poor	—	—	2	1.5	—	Oil.	.081	.745	57.9	{ 102 39	201 94	239 126	405 230	482 135	275
1080	Y'ish.	Good	—	—	2	2.0	—	Tr. corr.		.723	63.6	{ 126 52	185 85	219 104	289 133	358 108	226
405	Y'ish.	Benzol.	+	—	1	2.0	—	Gum.	.010	.821	40.5	{ 158 70	181 83	196 91	300 182	446 230	239 115
466	W. W.	Good	+	—	4	2.0	+	Bad corr., gum, oil.	.016	.750	56.7	{ 145 63	228 109	277 136	379 193	478 248	288
936	Y'ish.	do.	—	—	1	5.0	+	do.	.025	.730	61.8	{ 90 32	171 77	273 134	421 216	428 220	112
801	Y'ish.	do.	—	+	2	1.0	—	Tr. —		.710	67.2	{ 111 44	169 76	207 97	279 137	334 108	212
802	W. W.	do.	—	+	1	1.0	+	Gum.	.008	.745	57.9	{ 122 50	194 90	239 115	334 168	387 197	202
1071	Y. T.	do.	—	+	2	1.0	+	Oil.	.044	.728	62.3	{ 79 26	181 83	318 159	441 227	235 146	128
354	S. Y.	Poor	—	—	2	6.0	+	Corr., gum.	.034	.740	59.2	{ 120 49	219 104	282 139	379 193	441 229	280
579	W. W.	Good	+	—	2	3.0	—	Tr. corr.		.715	65.8	{ 118 48	174 79	207 97	291 144	383 195	221
580	W. W.	Poor	+	—	2	1.5	+	Gum.	.005	.753	55.9	{ 144 62	223 106	280 138	390 199	460 238	286
281	Y'ish.	Good	+	+	3	6.0	—	Corr., gum.	.030	.743	58.4	{ 113 45	198 92	257 125	363 181	424 201	141
326	Y. T.	Poor	—	—	1	5.5	+	Oil.	.024	.695	71.4	{ 95 35	126 52	169 76	280 138	381 194	189
325	Y. T.	Good	—	—	2	1.5	—	Corr., oil.	.024	.758	54.7	{ 144 62	228 109	277 136	378 181	417 214	270
402	W. W.	Poor	—	—	2	1.0	+	Corr., s. gum.	.016	.747	57.4	{ 138 59	212 100	262 128	361 183	411 227	133
445	Y'ish.	do.	—	+	2	2.0	—	S. corr., s. oil.	.020	.702	46.8	{ 140 60	189 94	217 103	339 176	417 214	246
446	Y'ish.	do.	+	+	3	1.0	—	Oil.	.015	.745	57.9	{ 140 60	194 90	234 112	327 164	401 205	238

447	141	Y. T.	Benzol.	—	1	3.0	—	Corr.	.015	.796	45.9	154	189	217	363	426	250
568	141	Y'ish.	Poor.	—	2	4.5	—	Oil.	.117	.736	60.2	68	87	103	184	219	121
567	141	Y'ish.	do.	—	2	3.5	—	Corr., gum.	.044	.750	56.7	108	138	147	197	226	280
581	141	W. W.	do.	+	2	2.5	+	Corr., gum, oil.	.025	.799	45.2	108	138	147	197	226	280
786	141	S. Y.	do.	—	2	5.0	+	Corr., gum.	.013	.768	52.3	108	138	147	197	226	280
866	141	Y'ish.	Benzol.	—	2	4.5	—	S. corr., oil.	.190	.791	47.0	108	138	147	197	226	280
569	142	Y'ish.	Poor.	—	2	4.5	+	Corr., gum, oil.	.028	.742	58.7	108	138	147	197	226	280
390	143	W. W.	Fair.	—	1	4.0	—	Oil.	.158	.741	58.9	108	138	147	197	226	280
710	144	W. W.	Poor.	—	2	3.0	+	Corr., gum.	.009	.805	43.9	108	138	147	197	226	280
711	144	W. W.	do.	—	2	2.5	+	Gum.	.012	.806	43.7	108	138	147	197	226	280
712	144	Y. T.	Benzol.	—	2	2.0	—	Corr., oil.	.011	.806	43.7	108	138	147	197	226	280
360	145	L. B.	Fair.	—	1	3.0	—	S. corr., gum.	.033	.753	55.9	108	138	147	197	226	280
467	146	S. Y.	Poor.	—	2	2.0	+	Corr., gum.	.017	.742	58.7	108	138	147	197	226	280
809	147	W. W.	Fair.	—	2	4.5	—	Gum.	.001	.798	45.4	108	138	147	197	226	280
764	148	Y'ish.	Poor.	+	4	3.0	—	Corr., oil.	.012	.750	56.7	108	138	147	197	226	280
924	148	S. Y. T.	Good.	+	3	1.5	—	Bad corr., gum.	.019	.752	56.2	108	138	147	197	226	280
925	148	S. Y. T.	do.	+	4	1.5	—	do.	.019	.749	56.9	108	138	147	197	226	280
1077	148	Bloom.	do.	—	1	5.0	—	Corr., oil.	.045	.738	59.7	108	138	147	197	226	280
468	149	S. Y.	Poor.	+	3	2.0	+	Tr. gum.	.013	.743	58.4	108	138	147	197	226	280
795	150	W. W.	Good.	—	1	2.0	—	Corr.	.012	.726	62.8	108	138	147	197	226	280
796	150	Y. T.	Poor.	+	1	1.5	+	do.	.022	.730	61.8	108	138	147	197	226	280
660	151	Y'ish.	do.	—	1	2.0	+	Corr., oil.	.024	.748	57.2	108	138	147	197	226	280
632	151	W. W.	Fair.	—	2	3.0	—	do.	.028	.744	58.2	108	138	147	197	226	280
549	154	Y'ish.	Benzol.	—	1	5.0	+	Corr., gum.	.030	.773	51.1	108	138	147	197	226	280
550	154	Y'ish.	Fair.	—	1	6.0	—	S. corr., gum.	.021	.766	52.8	108	138	147	197	226	280
810	155	Greenish.	Poor.	+	6	7.5	—	Corr., gum.	.111	.745	57.9	108	138	147	197	226	280

TABLE 16. —Data on tests of gasolines collected in 1919 survey, arranged to show refinery practices of companies—Continued.

JOBBERS—Continued.

Sam- ple No.	Com- pany No.	Color.	Odor.	Acidity.			Unsat- uration (per cent.).	Doctor test.	Corrosion and gumming test.		Gravity.		Selected distillation results.				Aver- age boil- ing point.	
				Methyl orange.	Litmus paper.	Phenol- phtha- lein (drops).			Nature of residue.	Weight of residue (grams).	Specific gravity.	°B.	Initial boil- ing point.	20 per cent mark.	50 per cent mark.	90 per cent mark.		Dry point.
713	156	S. Y. T....	Very poor....	—	—	2	2.5	+	Oil.....	0.019	0.730	61.8	{ 95 35 81	{ 194 90 176	{ 275 135 363	{ 417 214 518	{ 448 231 530	279
507	157	Y. T.....	Good.....	+	+	5	5.0	+	Gum, oil.....	.211	.748	57.2	{ 27 80	{ 184 270	{ 378 271	{ 378 271	{ 378 271	329
776	158	W. W.....	Poor.....	—	+	1	1.0	±	Tr.....	.....	.744	58.2	{ 122 203	{ 203 259	{ 259 378	{ 378 450	{ 450 270	270
904	159	W. W.....	Fair.....	+	—	2	4.0	—	Gum.....	.011	.752	56.2	{ 154 212	{ 154 212	{ 126 192	{ 318 381	{ 381 423	253
905	159	W. W.....	do.....	—	—	1	3.0	—	do.....	.015	.740	59.2	{ 144 210	{ 144 210	{ 239 302	{ 302 352	{ 352 244	244
838	160	W. W.....	do.....	+	—	4	1.0	—	Corr., gum.....	.017	.748	57.2	{ 158 219	{ 158 219	{ 273 330	{ 330 457	{ 457 286	286
469	162	W. W.....	do.....	+	—	4	4.0	+	Oil ⁵	1.468	.794	46.3	{ 149 307	{ 149 307	{ 415 505	{ 505 593	{ 593 387	387
721	164	S. Y.....	Poor.....	—	—	1	4.0	±	Corr., oil.....	.062	.721	64.2	{ 118 212	{ 118 212	{ 136 185	{ 212 273	{ 273 334	273
891	165	Y'ish.....	Bad.....	—	—	1	6.0	—	Oil.....	.030	.734	60.7	{ 100 203	{ 100 203	{ 298 394	{ 394 439	{ 439 284	284
892	165	Y'ish.....	Good.....	—	—	1	2.0	±	do.....	.028	.727	62.6	{ 88 180	{ 88 180	{ 306 392	{ 392 433	{ 433 279	279
817	166	W. W.....	Poor.....	+	+	10	2.0	+	do.....	.072	.752	56.2	{ 127 223	{ 127 223	{ 277 383	{ 383 486	{ 486 288	288
847	166	W. W.....	Fair.....	+	—	4	1.0	—	Corr., gum.....	.028	.749	56.9	{ 153 217	{ 153 217	{ 195 275	{ 275 383	{ 383 446	139
811	167	W. W.....	Good.....	—	—	2	3.5	—	Corr., gum, oil.....	.023	.739	59.4	{ 127 198	{ 127 198	{ 248 343	{ 343 401	{ 401 255	182
787	167	W. W.....	Poor.....	—	—	2	3.0	±	Gum, oil.....	.045	.716	65.5	{ 117 167	{ 117 167	{ 203 286	{ 286 378	{ 378 217	217
901	169	W. W.....	do.....	—	—	2	5.0	+	Corr., oily gum.....	.038	.740	59.2	{ 113 201	{ 113 201	{ 264 361	{ 361 419	{ 419 248	248
470	170	S. Y.....	Fair.....	+	—	5	4.0	+	Oil ⁶	3.350	.748	57.2	{ 100 192	{ 100 192	{ 320 505	{ 505 505	{ 505 316	316
592	170	Y'ish.....	Poor.....	—	—	1	3.5	—	Corr., oil.....	.147	.692	72.3	{ 97 124	{ 97 124	{ 165 295	{ 295 311	{ 311 181	181
593	170	Y'ish.....	Good.....	—	—	1	1.0	—	do.....	.085	.719	64.7	{ 108 160	{ 108 160	{ 226 342	{ 342 388	{ 388 235	235
594	170	Y'ish.....	do.....	—	+	2	3.0	—	Bad corr., oil.....	.039	.741	58.9	{ 140 219	{ 140 219	{ 270 352	{ 352 387	{ 387 271	271
													{ 60 104	{ 60 104	{ 132 178	{ 178 203	{ 203 133	133

665	170	Y'ish.....	Fair.....	+	+	3	3.0	+	Corr., oil.....	.053	.739	59.4	104	189	263	401	469	270
666	170	W.W.....	do.....	+	+	3	2.5	+	Corr., oil, gum.....	.044	.744	58.2	93	187	123	265	132	132
943	170	S.Y.....	Good.....	-	-	2	5.5	+	Oil.....	.019	.694	71.7	34	86	135	419	453	277
942	170	W.W.....	Poor.....	-	-	3	1.0	+	Oil, gum.....	.008	.746	57.7	99	131	172	215	234	136
598	171	Y'ish.....	do.....	+	+	2	4.0	+	Bad corr., gum.....	.026	.735	60.5	71	109	131	172	207	134
599	171	Y'ish.....	Good.....	-	-	2	7.0	-	S. corr., gum.....	.019	.736	60.2	160	228	268	342	405	273
766	173	Y'ish.....	Very good.....	+	+	4	1.0	+	Oil.....	1.669	.827	39.3	115	190	255	378	442	264
661	174	Y'ish.....	Poor.....	-	-	1	6.0	-	Corr., gum.....	.088	.754	55.7	162	194	392	500	536	351
765	174	Y'ish.....	Good.....	-	-	2	2.0	-	Corr., oil.....	.016	.750	56.7	72	90	200	260	280	177
406	175	Y.T.....	do.....	-	-	2	2.5	+	Oil, S. corr.....	.057	.757	54.9	37	108	137	190	228	138
1004	176	Y'ish.....	do.....	-	-	2	1.0	-	S. corr., gum.....	.016	.743	58.4	65	103	135	197	234	110
779	177	Y'ish.....	Very good.....	-	-	2	9.5	-	Gum, corr.....	.019	.740	59.2	149	217	275	387	453	284
473	178	Y'ish.....	Poor.....	+	+	5	1.0	-	Corr.....	.037	.748	57.2	140	228	288	414	475	297
744	179	W.W.....	Good.....	-	-	1	2.0	+	Tr. gum.....	.009	.750	56.7	60	109	142	212	246	147
745	179	S.Y.....	do.....	-	-	1	3.0	-	Oil.....	.004	.711	66.9	54	93	125	197	220	132
426	180	S. Y. T.....	do.....	-	-	1	2.0	-	Gum.....	.003	.750	56.7	124	205	257	354	414	261
427	180	Y'ish.....	do.....	-	-	1	3.5	-	do.....	.005	.739	59.4	111	219	275	370	419	279
428	180	Y'ish.....	Turpentine.....	+	+	2	7.0	-	do.....	.034	.719	64.7	122	212	262	360	423	268
488	180	Y'ish.....	Very good.....	-	-	2	3.0	+	Corr., gum.....	.037	.754	55.7	50	100	128	182	217	131
459	180	Y'ish.....	Good.....	-	-	1	1.5	-	Tr.....	.....	.737	60.0	171	203	275	313	214	101
460	180	W.W.....	Poor.....	-	-	2	3.0	-	Gum.....	.025	.712	66.6	151	277	392	455	522	282
629	181	S. Y. T.....	Benzol.....	-	-	2	2.0	-	Bad corr., oil.....	.037	.747	57.4	118	205	286	397	455	282
732	182	W.W.....	do.....	-	-	1	5.0	-	Oil.....	.015	.803	44.3	113	189	237	385	450	286
733	182	Y. T.....	do.....	-	-	1	4.0	-	Corr., oil.....	.014	.803	44.3	135	189	237	385	450	286
658	183	S. Y.....	Poor.....	-	-	2	2.0	-	Very bad corr.....	.049	.751	56.4	141	218	277	394	450	286
				-	-	2	2.0	-					111	187	244	381	439	261
				-	-	2	3.0	-					100	144	216	374	428	234
				-	-	2	2.0	-					102	208	298	439	408	297
				-	-	1	5.0	-					145	180	203	354	421	147
				-	-	1	4.0	-					153	183	203	352	430	241
				-	-	2	2.0	-					183	241	286	361	428	289
				-	-	2	2.0	-					84	116	141	183	220	143

* Residue heated 10 hours.

TABLE 16.—Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies—Continued.

Sample No.	Company No.	Color.	Odor.	Acidity.		Unsaturation (per cent).	Doclor test.	Corrosion and gumming test.		Gravity.		Selected distillation results.				Avor-boiling point.
				Methyl orange.	Phenolphthalein (drops).			Nature of residue.	Weight of residue (grams).	Specific gravity.	°B.	Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	
777	181	Y'ish.	Poor	—	1	1.0	—	Gum.	0.010	0.745	57.9	{ 135 57	201	244	343	257
778	184	W. W.	Good	—	1	1.0	—	Corr.	.007	.710	67.2	{ 113 205	117	118	173	213
797	181	W. W.	do.	—	2	1.0	—	Tr.	.....	.719	61.7	{ 131 185	185	219	316	388
798	184	W. W.	do.	+	2	1.0	—	Corr.	.016	.736	60.2	{ 135 108	185	211	331	408
659	185	W. W.	Poor	+	3	3.0	—	S. gum.	.013	.752	56.2	{ 135 92	207	255	363	441
1105	186	Y'ish.	do.	+	4	8.0	+	Corr., gum.	.038	.753	55.9	{ 106 41	221	302	412	459
1067	187	W. W.	do.	+	4	4.0	—	Oil.	.382	.718	65.0	{ 90 32	153	311	509	509
669	191	Y'ish.	Good	+	3	2.5	—	Corr., gum.	.046	.743	58.4	{ 131 55	203	255	370	433
670	191	Y'ish.	do.	—	3	1.0	+	Oil, gum	.020	.738	59.7	{ 122 90	194	246	351	421
595	192	Y'ish.	Very good	—	1	3.5	—	Corr., oil.	.096	.728	62.3	{ 90 89	192	288	399	408
596	192	Y'ish.	Good	—	1	3.0	—	do.	.035	.744	58.2	{ 100 87	189	277	415	423
875	193	Y'ish.	Poor	—	1	2.5	—	Oil.	.009	.700	70.0	{ 90 32	153	212	313	372
1091	194	Y'ish.	do.	—	2	1.5	—	S. corr.	.005	.743	58.4	{ 136 58	217	257	338	405
1092	194	W. W.	Good	—	2	1.0	—	S. corr., gum.	.012	.724	63.4	{ 120 49	203	244	327	399
1093	194	W. W.	Poor	—	2	1.5	±	Tr. corr., gum.	.....	.719	64.7	{ 120 49	178	212	306	367
1094	194	W. W.	Good	—	2	3.0	—	Tr. corr.	.....	.707	68.0	{ 111 44	163	201	270	334
1095	194	W. W.	Poor	—	1	2.0	—	do.	.....	.662	81.5	{ 111 44	151	183	255	315
984	195	Bloom.	Bad	—	2	1.0	—	Oil.	.059	.741	58.9	{ 122 50	190	241	354	432
714	196	W. W.	Good	—	2	2.0	—	Gum.	.009	.725	63.1	{ 135 57	196	245	315	383
715	196	Y. T.	do.	—	2	1.5	+	Oil.	.005	.742	58.7	{ 131 55	207	248	340	425

1081	197	Y'ish.....	Poor.....	+	+	4	5.0	-	Corr.....	.019	.740	59.2	106	190	259	374	426	261
1082	197	Y'ish.....	Good.....	-	-	2	4.0	-	S. corr., oil	.026	.719	64.7	77	151	126	190	219	217
881	198	Y'ish.....	Poor.....	-	-	1	4.0	-	Oil.....	.032	.739	59.4	113	217	280	370	423	253
1039	199	W. W.....	Fair.....	+	+	3	2.0	-	Oil gum.....	.028	.742	58.7	95	103	138	188	217	135
930	200	W. W.....	Poor.....	-	-	1	8.0	+	Oil.....	.028	.685	74.4	90	118	162	324	405	190
931	200	S. Y. T.....	Good.....	-	-	2	3.5	+	S. corr., gum.....	.010	.748	57.2	126	208	264	367	430	271
434	201	Y'ish.....	Poor.....	-	-	2	.5	+	Gum.....	.003	.746	57.7	147	228	271	345	403	273
819	203	W. W.....	Good.....	-	-	3	4.0	-	Corr., gum.....	.042	.739	59.4	102	198	302	403	446	286
543	204	L. B.....	Poor.....	-	-	1	4.0	+	do.....	.022	.741	58.9	138	214	266	352	412	270
806	205	Y. T.....	do.....	-	-	2	1.5	±	Corr.....	.027	.711	66.9	59	101	130	178	211	132
807	205	Y'ish.....	Good.....	-	-	1	3.5	-	do.....	.018	.739	59.4	118	201	253	365	428	262
408	206	Y'ish.....	do.....	-	-	2	2.0	-	Gum.....	.015	.757	54.9	104	185	248	352	405	252
589	207	W. W.....	Poor.....	+	+	3	3.0	±	Oil.....	.037	.736	60.2	136	203	244	352	450	261
407	208	Y'ish.....	Benzol.....	-	-	3	7.0	-	Gum.....	.010	.872	30.6	169	189	196	230	277	205
734	209	Y'ish.....	Poor.....	-	-	1	1.0	-	Oil.....	.005	.737	60.0	154	232	271	360	403	275
1028	210	O. K.....	O. K.....	-	-	.....	5.5	-	Gum.....	.037	.754	55.7	126	211	302	406	444	238
1029	210	O. K.....	do.....	-	-	.....	2.5	-	Gum, oil	.060	.725	63.1	90	163	266	396	426	261
895	211	Y'ish.....	Bad.....	-	-	1	.5	-	Tr. corr.....	.056	.749	56.9	65	107	139	207	220	138
896	211	Y'ish.....	Benzol.....	-	-	1	2.5	-	Oil.....	.036	.728	62.3	81	181	289	446	453	282
1072	211	W. W.....	Good.....	+	+	2	1.0	±	Tr.....	.045	.745	57.9	113	207	257	378	437	268
735	212	Y'ish.....	Benzol.....	-	-	1	3.5	+	Gum.....	.020	.845	35.7	172	190	207	291	383	230
736	212	Y'ish.....	do.....	-	-	1	3.5	+	do.....	.015	.845	35.7	78	88	97	144	195	110
287	213	Y'ish.....	Good.....	+	+	1	3.0	.....	Corr., gum.....	.047	.747	57.4	113	205	270	383	455	275
634	214	Y'ish.....	Poor.....	-	-	2	4.0	+	Corr., oil.....	.028	.738	59.7	135	198	244	356	417	257
635	214	Y'ish.....	do.....	-	-	3	3.5	+	S. corr., gum.....	.019	.751	56.4	57	92	118	180	214	125
647	215	Y'ish.....	(Good.....	-	-	1	.5	±	Corr., gum.....	.031	.741	58.9	62	91	219	282	424	295
				-	-	1							145	207	223	352	428	246
													63	97	123	178	220	130

TABLE 16.—Data on tests of gasolines collected in the 1919 survey, arranged to show refinery practice of companies—Continued.
JOBBERS—Continued.

Sam- ple No.	Com- pany No.	Color.	Odor.	Acidity.			Unsat- uration (per cent).	Doctor test.	Corrosion and gumming test.		Gravity.		Selected distillation results.				Aver- age boll- ing point. °F.
				Methyl orange.	Litmus paper.	Phenol- phthal- ein (drops).			Nature of residue.	Weight of residue (grams).	Specific gravity.	B.	Initial boll- ing point. °F.	20 per cent mark.	50 per cent mark.	90 per cent mark.	
648	215	W. W.	Good.	+	+	2	1.0	+	S. corr., gum.	0.018	0.756	55.2	167	255	282	376	291
409	217	Y'ish.	Benzol.	—	—	2	4.0	±	Gum.	.003	.860	32.8	75	113	139	191	230
544	218	S. Y.	Fair.	—	—	1	8.0	—	Corr., gum.	.016	.745	57.9	167	83	88	208	213
347	219	W. W.	Fair.	—	—	1	3.0	±	S. gum.	.009	.744	58.2	167	112	147	200	243
348	219	W. W.	Fair.	—	—	2	4.0	—	Gum.	.007	.741	58.9	162	244	280	358	297
1007	220	Y'ish.	do.	+	—	3	1.0	+	Corr., gum.	.017	.747	57.4	178	239	277	352	286
643	221	Y'ish.	Poor.	—	—	2	2.5	—	Corr., oil.	.038	.739	59.4	149	214	266	349	282
644	221	W. W.	Good.	—	—	1	1.0	—	Corr., gum.	.008	.752	56.2	172	228	270	356	282
950	223	Y'ish.	Bad.	—	—	2	2.0	—	Bad corr.	.051	.748	57.2	129	225	280	372	282
663	227	W. W.	Good.	—	—	2	4.5	—	Corr.	.030	.746	57.7	100	201	266	374	270
501	228	W. W.	do.	—	—	1	2.0	+	Gum.	.013	.740	59.2	136	228	275	361	279
502	228	S. Y.	do.	—	—	1	2.0	—	do.	.004	.743	58.4	58	109	183	221	137
506	228	Y'ish.	do.	—	—	1	1.0	+	S. corr.	.018	.733	61.0	70	119	140	185	218
882	230	Y'ish.	Poor.	—	—	2	5.0	+	Corr., gum.	.040	.741	58.9	46	87	118	174	252
719	231	S. Y. T.	Benzol.	—	—	2	2.5	±	Oil.	.029	.770	51.8	53	105	135	190	224
720	231	Y'ish.	Poor.	—	—	2	3.0	+	do.	.033	.736	60.2	113	198	282	392	276
422	232	Y'ish.	Good.	—	—	1	1.0	+	Corr.	.011	.755	55.4	102	239	298	408	283
628	233	W. W.	do.	—	—	1	2.0	+	Corr., gum.	.009	.751	56.4	39	115	148	200	222
830	234	Y'ish.	Poor.	+	+	4	3.0	+	Oil.	.041	.754	55.7	160	241	284	372	291
1056	236	Y'ish.	do.	—	—	2	.5	—	S. corr., gum.	.009	.776	50.4	71	116	140	189	244
555	238	Y'ish.	Bad.	+	—	4	3.0	+	Tr. gum.	.007	.747	57.4	136	214	280	392	283
													108	199	311	441	300
													162	217	253	327	249
													172	203	263	394	262
													163	244	293	381	298
													73	118	145	194	148

832	239	W. W.	Poor.	—	—	1	1.5	—	Gum.	.011	.748	57.2	165	217	257	340	397	205
854	240	S. Y.	Fair.	—	—	3	7.0	+	Corr., gum.	.013	.743	58.4	118	103	125	171	203	130
605	241	Y'ish.	Poor.	—	—	3	9.0	+	Corr., oil.	.038	.738	59.7	109	100	135	198	225	137
606	241	Y'ish.	Good.	—	—	1	4.0	+	do.	.069	.738	59.7	88	88	126	190	223	128
1098	242	W. W.	do.	—	—	2	1.0	—	S. corr., gum.	.004	.733	61.0	31	31	186	140	197	133
1099	242	W. W.	Poor.	—	—	2	3.0	—	do.	.049	.753	55.9	117	183	230	320	396	239
1100	242	Y'ish.	Good.	—	—	2	2.0	—	do.	.001	.712	66.6	109	167	208	286	347	212
702	243	Y. T.	do.	—	—	2	3.0	+	Gum.	.038	.735	60.5	111	203	279	307	412	271
703	243	Y. T.	do.	—	—	1	3.0	+	Gum.	.038	.735	60.5	111	203	279	307	412	271
453	244	S. Y.	Poor.	—	—	2	1.5	+	Oil.	.036	.752	56.2	142	216	266	378	467	279
454	244	W. W.	Good.	+	+	4	2.0	+	Corr.	.019	.735	60.5	113	185	235	349	424	248
577	246	W. W.	Poor.	+	+	2	4.0	+	Corr., gum.	.012	.750	56.7	122	205	264	365	423	266
578	246	W. W.	do.	+	+	3	4.0	+	do.	.026	.734	60.7	100	187	248	342	401	250
487	247	S. Y.	Fair.	+	+	2	3.0	+	do.	.009	.738	59.7	117	198	237	370	433	264
488	247	S. Y.	Poor.	+	+	2	2.0	—	Corr., oil.	.052	.747	57.4	131	225	282	374	428	282
489	247	W. W.	do.	—	—	2	4.0	±	do.	.008	.738	59.7	122	196	253	381	433	266
490	247	Y'ish.	Fair.	+	+	6	3.0	—	Gum, oil.	.088	.748	57.2	138	223	273	370	424	279
261	248	W. W.	Good.	—	—	1	2.0	+	S. corr., gum.	.018	.767	52.5	154	223	271	372	432	280
387	249	Y'ish green	Poor.	—	—	1	3.0	—	Oil.	.552	.751	56.4	133	190	248	372	464	264
270	249	Y'ish.	Fair.	—	—	2	5.0	—	Very bad corr., gum.	.033	.781	49.3	154	199	253	358	414	264
910	254	O. K.	O. K.	—	—	—	3.0	—	Corr., gum.	.022	.749	56.9	136	203	248	333	392	253
562	255	W. W.	Good.	—	—	—	2.0	+	Gum.	.019	.749	56.9	129	210	259	347	403	262
563	255	W. W.	do.	—	—	—	1.5	—	Oil.	.019	.720	64.4	127	172	199	262	320	208
542	257	L. B.	Fair.	—	—	1	6.0	—	Corr., gum.	.044	.748	57.2	149	226	291	383	437	289
													65	108	144	195	235	143

1. In the color column W. W. means "water white"; Y. T., "yellow tint"; S. Y. T., "slight yellow tint"; Y'ish, "yellowish"; Bloom, "fluorescent color"; S. Y., "slightly yellow"; L. B., "light brown".

2. Tests giving an acid reaction with methyl orange indicator, or litmus paper, are reported (+), neutral tests, (—). No sample gave an alkaline reaction. Results of phenolphthalein tests are expressed in number of drops of N/100 NaOH solution required to produce a pink color.

3. Negative doctor tests are reported (—); positive tests are reported (X); doubtful tests are reported (±).

4. In the residue column Corr. represents "corrosion"; S. corr., "slight corrosion"; Peac., "peacock color, iridescence."

5. For each sample the upper line of figures represents temperatures in degrees Fahrenheit, and the lower in degrees centigrade.

TABLE 17.—*Marketing and analytical data for gasolines*

ALABAMA.

Sample No.	City.	Company No.	Sample collected from ¹	Price (cents per gallon).		Color. ²	Odor.	Unsaturation (per cent).	Doctor test.	Gravity.	
				Retail.	Tank wagon.					Specific gravity.	Degrees Baumé.
1	Birmingham.....	12	F.	26	24	W. W.	Cracked.	3.0	±	0.745	57.9
2	do.....	40	F.	26	24	W. W.	O. K....	1—	—	.740	59.2
3	do.....	1	F.	26	24	W. W.	O. K....	1—	—	.745	57.9
4	do.....	75	F.	26	24	W. W.	O. K....	1—	—	.737	60.0
5	do.....	6	F.	26	24	W. W.	O. K....	1—	±	.744	58.2
6	do.....	2	F.	26	24	W. W.	O. K....	1—	—	.739	59.4
7	do.....	75	G	26	24	W. W.	O. K....	1—	—	.738	59.7
8	do.....	6	F.	26	24	W. W.	O. K....	1—	—	.743	58.4
9	do.....	12	G.	26	24	W. W.	O. K....	3.0	—	.745	57.9
10	do.....	248	F.	26	.....	W. W.	O. K....	1—	—	.743	58.4

ARKANSAS.

11	Fort Smith.....	1	F.	.....	.....	W. W.	O. K....	1—	±	0.745	57.9
12	do.....	15	F.	.....	.....	W. W.	O. K....	1—	±	.747	57.4

CALIFORNIA.

13	Berkeley.....	16	F.	.....	.....	W. W.	Good....	1—	—	0.751	56.4
14	do.....	70	F.	.....	.....	W. W.	Good....	1—	—	.739	59.4
15	do.....	13	F.	.....	.....	W. W.	Good....	1—	—	.747	57.4
16	do.....	19	F.	.....	.....	W. W.	Good....	1—	—	.748	57.2
17	San Francisco....	14	F.	.....	.....	W. W.	Good....	1—	—	.740	59.2
18	do.....	13	F.	.....	.....	W. W.	Good....	1—	—	.751	56.4
19	do.....	19	F.	.....	.....	W. W.	Good....	1—	—	.748	57.2

¹ In this column D means "distributing station"; F, "filling station"; G, "garage"; R, "refinery"; S, "service station"; T, "tank wagon"; W, "warehouse"; X, retail store.

² W. W., "water white"; Y, "yellowish"; S. Y., "slightly yellow"; B. T., "blue tint"; Y. T., "yellow tint."

collected in the 1917 survey, arranged by States.

ALABAMA.

Distillation. ³														Sample No.
Initial boiling point.	10 per cent mark.	20 per cent mark.	30 per cent mark.	40 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	Dry point.	Average boiling point.	Distillation loss (per cent).	
{ 117 47	185 85	212 100	230 110	244 118	259 126	271 133	291 144	313 156	347 175	388 198	424 218	261 127	1.0	1
{ 118 48	174 79	190 88	205 96	217 103	230 110	248 120	262 128	284 140	318 159	349 176	379 193	239 115	1.0	2
{ 113 45	185 85	216 102	237 114	255 124	255 124	288 142	306 152	324 162	349 176	376 191	403 206	266 130	1.5	3
{ 124 51	190 88	207 97	219 104	234 112	246 119	248 120	277 136	293 145	320 160	347 175	383 195	250 121	1.0	4
{ 108 42	172 78	210 99	239 115	257 125	277 136	293 145	313 156	327 164	363 184	396 202	421 216	271 133	1.5	5
{ 118 48	176 80	198 92	212 100	226 108	232 111	239 115	275 135	298 148	329 165	365 185	401 205	246 119	1.0	6
{ 127 53	190 88	208 98	221 105	234 112	246 119	261 127	277 136	298 148	324 162	352 178	385 196	252 122	1.0	7
{ 104 40	172 78	210 99	246 119	257 125	275 135	295 146	311 155	331 166	361 183	394 201	419 215	271 133	2.0	8
{ 115 46	185 85	212 100	228 109	244 118	257 125	266 130	288 142	306 152	334 168	363 184	396 202	257 125	1.0	9
{ 122 50	176 80	190 88	205 96	217 103	232 111	248 120	268 131	291 144	320 160	340 171	381 194	241 116	1.0	10

ARKANSAS.

{ 104 40	169 76	208 98	235 113	255 124	268 131	293 145	304 151	334 168	370 188	419 215	464 240	273 134	1.5	11
{ 104 40	172 78	198 92	216 102	232 111	248 120	255 124	284 140	304 151	324 162	360 182	394 201	248 120	1.5	12

CALIFORNIA.

{ 124 51	185 85	201 94	212 100	223 106	230 111	243 117	252 122	268 131	289 143	311 155	338 170	234 112	1.0	13
{ 90 32	153 67	189 87	212 100	226 108	239 115	244 118	271 133	291 144	325 163	.....	379 193	239 115	3.0	14
{ 122 50	169 76	185 85	194 90	203 95	212 100	219 104	226 108	243 117	266 130	288 142	315 157	216 102	1.2	15
{ 120 49	165 74	180 82	190 88	199 93	207 97	216 102	228 109	243 117	270 132	298 148	331 166	214 101	1.1	16
{ 113 45	165 74	187 86	201 94	214 101	226 108	239 115	252 122	279 137	311 155	347 175	374 190	234 112	1.1	17
{ 126 52	176 80	190 83	199 93	208 98	217 103	226 108	237 114	253 123	280 138	309 154	342 172	223 106	1.0	18
{ 118 48	167 75	181 83	190 88	199 93	208 98	217 103	228 109	244 118	270 132	297 147	331 166	214 101	1.0	19

³For each sample, the upper line of figures are in degrees Fahrenheit, and the lower line, in degrees centigrade.

TABLE 17.—Marketing and analytical data for gasolines

CALIFORNIA—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price (cents per gallon).		Color.	Odor.	Unsaturation (per cent).	Doctor test.	Gravity.	
				Retail.	Tank wagon.					Specific gravity.	Degrees Baumé.
20	San Francisco.....	16	F.	.....	.....	W. W.	Good....	1—	—	0.751	56.4
21	Los Angeles.....	13	F.	.....	.....	W. W.	Good....	1—	—	.740	59.2
22	do.....	74	F.	.....	.....	W. W.	Good....	1—	—	.740	59.2
23	do.....	84	F.	.....	.....	W. W.	Good....	1—	—	.728	62.3
24	do.....	72	F.	.....	.....	W. W.	Good....	1—	±	.740	59.2
25	do.....	70	F.	.....	.....	W. W.	Good....	1—	±	.772	51.3
26	do.....	70	F.	.....	.....	W. W.	Good....	1—	±	.720	64.4
27	do.....	92	F.	.....	.....	W. W.	Good....	1—	—	.750	56.7
28	do.....	14	F.	.....	.....	W. W.	Good....	1—	—	.744	58.2
29	Santa Maria.....	70	R.	.....	.....	W. W.	Good....	1—	—	.722	63.9

COLORADO.

30	Denver.....	97	F.	25	.....	W. W.	O. K....	1—	—	0.743	58.4
31	do.....	10	F.	25	.....	W. W.	O. K....	3.0	+	.743	58.4
32	do.....	4	F.	25	.....	W. W.	O. K....	1—	+	.737	60.0
33	do.....	1	F.	25	.....	W. W.	O. K....	2.0	+	.745	57.9
34	do.....	10	F.	31	.....	W. W.	O. K....	1—	+	.705	68.6
35	do.....	10	F.	25	.....	W. W.	O. K....	2.5	+	.741	58.9
36	do.....	1	F.	25	.....	W. W.	O. K....	2.5	+	.742	58.7
37	do.....	4	F.	25	.....	W. W.	O. K....	1—	+	.739	59.4
38	do.....	141	F.	25	.....	W. W.	O. K....	1.0	±	.742	58.7
39	Golden.....	10	F.	25	.....	S. Y..	Like kerosene.	3.0	+	.744	58.2
40	do.....	1	G.	25	.....	W. W.	O. K....	1.0	—	.743	58.4
41	do.....	10	.....	.....	.....	W. W.	O. K....	2.0	—	.751	56.4

collected in the 1917 survey, arranged by States—Continued.

CALIFORNIA—Continued.

Distillation.														Sample No.
Initial boiling point.	10 per cent mark.	20 per cent mark.	30 per cent mark.	40 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	Dry point.	Average boiling point.	Distillation loss (per cent).	
{ 115 46	{ 180 82	{ 198 92	{ 210 99	{ 221 105	{ 230 110	{ 230 110	{ 253 123	{ 268 131	{ 289 143	{ 311 155	{ 333 167	{ 230 110	{ 1.0	20
{ 104 40	{ 167 75	{ 187 86	{ 199 93	{ 210 99	{ 221 105	{ 230 110	{ 244 118	{ 259 126	{ 280 138	{ 302 150	{ 333 167	{ 221 105	{ 1.0	21
{ 95 35	{ 138 59	{ 171 77	{ 194 90	{ 210 99	{ 223 106	{ 235 113	{ 246 119	{ 268 131	{ 295 146	{ 327 164	{ 342 172	{ 219 104	{ 2.0	22
{ 100 38	{ 149 65	{ 174 79	{ 190 88	{ 203 95	{ 216 102	{ 228 109	{ 235 113	{ 261 127	{ 288 142	{ 315 157	{ 340 171	{ 217 103	{ 1.5	23
{ 104 40	{ 151 66	{ 176 80	{ 192 89	{ 205 96	{ 217 103	{ 228 109	{ 235 113	{ 259 126	{ 288 142	{ 315 157	{ 347 175	{ 219 104	{ 1.0	24
{ 100 38	{ 214 101	{ 244 118	{ 264 129	{ 279 137	{ 291 144	{ 306 152	{ 322 161	{ 343 173	{ 381 194	{ 428 220	{ 448 231	{ 291 144	{ 2.0	25
{ 95 35	{ 124 51	{ 149 65	{ 174 79	{ 198 92	{ 217 103	{ 235 113	{ 257 125	{ 286 141	{ 333 167	{	{ 385 196	{ 223 106	{ 3.0	26
{ 108 42	{ 169 76	{ 194 90	{ 210 99	{ 221 105	{ 232 111	{ 241 116	{ 255 124	{ 271 133	{ 293 145	{ 318 159	{ 343 173	{ 230 110	{ 1.5	27
{ 104 40	{ 156 69	{ 181 83	{ 199 93	{ 212 100	{ 225 107	{ 237 114	{ 246 119	{ 268 131	{ 293 145	{ 325 163	{ 345 174	{ 225 107	{ 1.0	28
{ 88 31	{ 133 56	{ 158 70	{ 180 82	{ 198 92	{ 212 100	{ 230 110	{ 248 120	{ 273 134	{ 311 155	{ 360 182	{ 370 188	{ 217 103	{ 3.5	29

COLORADO.

{ 133 56	{ 187 86	{ 210 99	{ 226 108	{ 244 118	{ 259 126	{ 277 136	{ 298 148	{ 322 161	{ 354 179	{ 383 195	{ 405 207	{ 264 129	{ 1.5	30
{ 120 49	{ 178 81	{ 201 94	{ 221 105	{ 239 115	{ 257 125	{ 279 137	{ 302 150	{ 329 165	{ 367 186	{ 406 208	{ 417 214	{ 264 129	{ 2.0	31
{ 133 56	{ 187 86	{ 208 98	{ 225 107	{ 239 115	{ 257 125	{ 275 135	{ 293 145	{ 315 157	{ 352 178	{ 383 195	{ 412 211	{ 262 128	{ 1.5	32
{ 122 50	{ 174 79	{ 201 94	{ 239 115	{ 239 115	{ 257 125	{ 277 136	{ 300 149	{ 327 164	{ 365 185	{ 406 208	{ 426 219	{ 266 130	{ 2.0	33
{ 100 38	{ 131 55	{ 149 65	{ 162 72	{ 176 80	{ 190 88	{ 203 95	{ 219 104	{ 239 115	{ 280 138	{ 333 167	{ 333 167	{ 201 94	{ 3.0	34
{ 117 47	{ 167 75	{ 194 90	{ 214 101	{ 232 111	{ 252 122	{ 273 134	{ 295 146	{ 318 159	{ 354 179	{ 388 198	{ 412 211	{ 257 125	{ 2.0	35
{ 120 49	{ 181 83	{ 205 96	{ 223 106	{ 243 117	{ 262 128	{ 282 139	{ 304 151	{ 325 163	{ 369 187	{ 410 210	{ 428 220	{ 268 131	{ 2.0	36
{ 124 51	{ 181 83	{ 205 96	{ 223 106	{ 239 115	{ 253 123	{ 271 133	{ 289 143	{ 316 158	{ 349 176	{ 381 194	{ 410 210	{ 261 127	{ 1.5	37
{ 104 40	{ 167 75	{ 201 94	{ 230 110	{ 255 124	{ 280 138	{ 307 153	{ 334 168	{ 370 188	{ 417 214	{ 462 239	{ 487 253	{ 288 142	{ 1.5	38
{ 129 54	{ 183 84	{ 208 98	{ 225 107	{ 243 117	{ 261 127	{ 279 137	{ 302 150	{ 320 160	{ 365 185	{ 399 204	{ 421 216	{ 266 130	{ 1.5	39
{ 118 48	{ 176 80	{ 205 96	{ 223 106	{ 241 116	{ 259 126	{ 279 137	{ 302 150	{ 329 165	{ 365 185	{ 397 203	{ 426 219	{ 266 130	{ 2.0	40
{ 133 56	{ 183 84	{ 198 92	{ 226 108	{ 246 119	{ 266 130	{ 286 141	{ 307 153	{ 333 167	{ 369 187	{ 399 204	{ 414 212	{ 270 132	{ 1.5	41

TABLE 17.—*Marketing and analytical data for gasolines*

COLORADO—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price (cents per gallon).		Color.	Odor.	Unsaturation (per cent).	Doctor test.	Gravity.	
				Retail.	Tank wagon.					Specific gravity.	Degrees Baumé.
42	Golden.....	1	.....	.....	.....	W. W.	O. K....	4.0	—	0.750	56.7
43	do.....	1	.....	.....	.....	W. W.	O. K....	3.0	—	.746	57.7

ILLINOIS.

44	Chicago.....	6	F.	21	19	W. W.	O. K....	1—	+	0.743	58.4
45	do.....	54	G.	21	19	S. Y..	O. K....	1—	+	.738	59.7
46	do.....	211	F.	21	.....	W. W.	O. K....	1—	±	.730	61.8
47	do.....	1	T.	21	19	W. W.	O. K....	1—	—	.737	60.0
48	do.....	46	D.	22	19	W. W.	O. K....	1—	±	.742	58.7
49	do.....	1	G.	21	19	W. W.	O. K....	1—	—	.737	60.0
50	do.....	3	F.	21	.....	W. W.	O. K....	5.0	—	.746	57.7
51	do.....	211	F.	21	.....	W. W.	O. K....	1—	±	.728	62.3
52	do.....	3	G.	22	.....	W. W.	O. K....	5.0	—	.746	57.7
53	do.....	211	F.	21	.....	W. W.	O. K....	1—	±	.730	61.8
54	do.....	54	G.	21	19	S. Y..	O. K....	1—	+	.739	59.4

KENTUCKY.

55	Louisville.....	157	F.	23½	22	W. W.	O. K....	1—	—	0.742	58.7
56	do.....	2	G.	26	22	W. W.	O. K....	1—	—	.737	60.0
57	do.....	228	F.	24	22	W. W.	O. K....	1—	±	.738	59.7
58	do.....	12	F.	24	22	W. W.	O. K....	1—	±	.736	60.2
59	do.....	2	F.	24	22	W. W.	O. K....	1—	—	.736	60.2
60	do.....	108	G.	26	22	W. W.	O. K....	1—	—	.742	58.7
61	Newport.....	12	F.	24	22	W. W.	O. K....	1—	±	.739	59.4

collected in the 1917 survey, arranged by States—Continued.

COLORADO—Continued.

Distillation.														Sample No.
Initial boiling point.	10 per cent mark.	20 per cent mark.	30 per cent mark.	40 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	Dry point.	Average boiling point.	Distillation loss (per cent).	
{ 129 54	{ 180 82	{ 205 96	{ 217 103	{ 226 108	{ 261 127	{ 277 136	{ 300 149	{ 329 165	{ 365 185	{ 399 204	{ 426 219	{ 264 129	{ 1.5	42
{ 129 54	{ 180 82	{ 205 96	{ 216 102	{ 234 112	{ 244 118	{ 280 138	{ 300 149	{ 327 164	{ 367 186	{ 399 204	{ 421 216	{ 264 129	{ 1.0	43

ILLINOIS.

{ 122 50	{ 185 85	{ 207 97	{ 223 106	{ 237 114	{ 252 122	{ 273 134	{ 293 145	{ 320 160	{ 358 181	{ 396 202	{ 435 224	{ 264 129	{ 1.0	44
{ 109 43	{ 172 78	{ 201 94	{ 223 106	{ 241 116	{ 261 127	{ 277 136	{ 304 151	{ 329 165	{ 369 187	{ 403 206	{ 410 210	{ 264 129	{ 1.0	45
{ 104 40	{ 153 67	{ 192 89	{ 226 108	{ 250 121	{ 270 132	{ 289 143	{ 306 152	{ 320 160	{ 343 173	{ 378 192	{ 392 200	{ 259 126	{ 2.0	46
{ 106 41	{ 158 70	{ 194 90	{ 221 105	{ 243 117	{ 261 127	{ 273 134	{ 298 148	{ 318 159	{ 347 175	{ 379 193	{ 396 202	{ 255 124	{ 2.0	47
{ 149 65	{ 201 94	{ 216 102	{ 228 109	{ 239 115	{ 253 123	{ 264 129	{ 286 141	{ 307 153	{ 338 170	{ 369 187	{ 408 209	{ 262 128	{ 1.0	48
{ 120 49	{ 181 83	{ 201 94	{ 219 104	{ 235 113	{ 250 121	{ 264 129	{ 289 143	{ 311 155	{ 340 171	{ 369 187	{ 392 200	{ 255 124	{ 1.0	49
{ 102 39	{ 176 80	{ 214 101	{ 241 116	{ 261 127	{ 279 137	{ 297 147	{ 313 156	{ 336 169	{ 367 186	{ 405 207	{ 415 213	{ 273 134	{ 2.0	50
{ 99 37	{ 145 63	{ 181 83	{ 212 100	{ 237 114	{ 259 126	{ 279 137	{ 302 150	{ 325 163	{ 358 181	{ 399 204	{ 408 209	{ 255 124	{ 2.5	51
{ 104 40	{ 176 80	{ 214 101	{ 241 116	{ 261 127	{ 279 137	{ 298 148	{ 313 156	{ 338 170	{ 367 186	{ 397 203	{ 419 215	{ 273 134	{ 2.0	52
{ 100 38	{ 147 64	{ 183 84	{ 216 102	{ 241 116	{ 262 128	{ 282 139	{ 300 149	{ 324 162	{ 354 179	{ 396 202	{ 406 208	{ 257 125	{ 2.5	53
{ 118 48	{ 172 78	{ 201 94	{ 225 107	{ 244 118	{ 264 129	{ 286 141	{ 311 155	{ 342 172	{ 383 195	{ 428 220	{ 455 235	{ 273 134	{ 1.5	54

KENTUCKY.

{ 86 30	{ 185 85	{ 244 118	{ 277 136	{ 298 148	{ 320 160	{ 340 171	{ 365 185	{ 397 203	{ 446 230	{ 482 250	{ 482 250	{ 331 166	{ 5.0	55
{ 126 52	{ 183 84	{ 205 96	{ 221 105	{ 230 110	{ 246 119	{ 264 129	{ 280 138	{ 298 148	{ 329 165	{ 365 185	{ 405 207	{ 253 123	{ 1.0	56
{ 104 40	{ 185 85	{ 221 105	{ 241 116	{ 259 126	{ 273 134	{ 293 145	{ 311 155	{ 331 166	{ 367 186	{ 396 202	{ 428 220	{ 273 134	{ 2.0	57
{ 109 48	{ 167 75	{ 194 90	{ 217 103	{ 235 113	{ 257 125	{ 275 135	{ 295 146	{ 327 164	{ 363 184	{ 403 206	{ 433 223	{ 261 127	{ 2.0	58
{ 117 47	{ 187 86	{ 208 98	{ 221 105	{ 241 116	{ 248 120	{ 259 126	{ 280 138	{ 302 150	{ 334 166	{ 367 186	{ 401 215	{ 255 124	{ 1.5	59
{ 104 40	{ 162 72	{ 216 102	{ 255 124	{ 284 140	{ 307 153	{ 333 167	{ 352 178	{ 374 190	{ 406 208	{ 433 223	{ 446 230	{ 295 146	{ 2.5	60
{ 117 47	{ 172 78	{ 199 93	{ 219 104	{ 239 115	{ 257 125	{ 277 136	{ 302 150	{ 329 165	{ 369 187	{ 405 207	{ 424 218	{ 264 129	{ 1.0	61

TABLE 17.—*Marketing and analytical data for gasolines*

LOUISIANA.

Sample No.	City.	Company No.	Sample collected from—	Price (cents per gallon).		Color.	Odor.	Unsaturation (per cent).	Doctor test.	Gravity.	
				Retail.	Tank wagon.					Specific gravity.	Degrees Baumé.
62	New Orleans.....	17	F.	23½	21½	W. W.	O. K....	1—	+	0.737	60.0
63	do.....	56	F.	22½	21½	W. W.	O. K....	1—	—	.735	60.5
64	do.....	2	F.	22½	21½	W. W.	O. K....	1—	—	.739	59.4
65	do.....	188	G.	23½	21½	W. W.	O. K....	1—	—	.734	60.7
66	do.....	1	F.	22½	21½	W. W.	O. K....	1—	—	.743	58.4
67	do.....	■	G.	23½	21½	W. W.	O. K....	1—	—	.741	58.9
68	do.....	172	F.	22½	21½	W. W.	O. K....	1—	—	.740	59.2

MAINE.

69	Portland.....	5	G.	.....	.....	W. W.	O. K....	1—	+	0.741	58.9
70	do.....	1	F.	26	.....	W. W.	O. K....	4.0	—	.741	58.9
71	do.....	83	G.	26	.....	W. W.	O. K....	1—	—	.737	60.0
72	do.....	83	G.	28	.....	W. W.	O. K....	1—	—	.737	60.0
73	do.....	5	G.	26	.....	W. W.	O. K....	4.0	+	.746	57.7
74	do.....	2	F.	27		W. W.	O. K....	1—	—	.740	59.2

MARYLAND.

75	Baltimore.....	51	R.			W. W.	{ Like kerosene. }	1—	—	0.745	57.9
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MASSACHUSETTS.

76	Boston.....	154	F.	25		W. W.	O. K....	4.0	±	0.737	60.0
77	do.....	60	F.	25		W. W.	O. K....	4.0	+	.737	60.0
78	do.....	5	F.	27	.....	W. W.	O. K....	4.0	—	.739	59.4
79	do.....	5	F.	25	.....	W. W.	O. K....	1—	—	.740	59.2
80	do.....	68	F.	25	.....	W. W.	O. K....	1—	—	.739	59.4
81	Cambridge.....	21	F.	25	.....	W. W.	O. K....	3.0	—	.735	60.5
82	New Bedford.....	5	G.	28	.....	W. W.	O. K....	6.0	+	.738	59.7
83	do.....	216	F.	25	.....	W. W.	O. K....	1—	—	.741	58.9

collected in the 1917 survey, arranged by States—Continued.

LOUISIANA.

Distillation.													Sample No.	
Initial boiling point.	10 per cent mark.	20 per cent mark.	30 per cent mark.	40 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	Dry point.	Average boiling point.		Distillation loss (per cent).
126	198	216	228	239	250	261	275	289	313	333	369	252	1.0	62
52	92	102	109	115	121	127	135	143	156	167	187	122		
127	196	221	241	259	279	288	320	343	378	410	437	280	1.0	63
53	91	105	116	126	137	142	160	173	192	210	225	138		
122	185	207	223	235	250	264	279	302	333	363	401	255	1.5	64
50	85	97	106	113	121	129	137	150	167	184	205	124		
104	163	207	237	261	270	304	324	347	379	406	428	275	1.5	65
40	73	97	114	127	132	151	162	175	193	208	220	135		
113	180	207	230	250	266	282	302	320	347	374	401	264	1.5	66
45	82	97	110	121	130	139	150	160	175	190	205	129		
188	183	216	237	257	277	295	316	334	365	396	419	275	1.0	67
48	84	102	114	125	136	146	158	168	185	202	215	135		
131	176	208	223	239	253	268	288	311	347	385	424	261	1.5	68
55	80	98	106	115	123	131	142	155	175	196	218	127		

MAINE.

111	158	185	199	221	243	253	275	295	329	361	365	239	2.6	69
44	70	85	93	105	117	123	135	146	165	183	185	115		
104	171	194	232	250	264	275	293	306	331	363	372	253	2.5	70
40	77	90	111	121	129	135	145	152	166	184	189	123		
140	190	208	221	230	243	253	268	284	313	340	367	246	1.5	71
60	88	98	105	110	117	123	131	140	156	171	186	119		
129	192	210	223	235	246	257	268	286	311	334	365	248	1.0	72
54	89	99	106	113	119	125	131	141	155	168	185	120		
129	187	216	234	248	264	277	293	311	336	365	385	262	1.4	73
54	86	102	112	120	129	136	145	155	169	185	196	128		
127	174	198	216	230	244	259	277	295	327	356	383	248	1.5	74
53	79	92	102	110	118	126	136	146	164	180	195	120		

MARYLAND.

140	198	217	234	250	264	279	297	313	338	363	381	264	1.5	75
60	92	103	112	121	129	137	147	156	170	184	194	129		

MASSACHUSETTS.

115	169	196	216	230	244	257	271	289	313	338	361	243	1.5	76
46	76	91	102	110	118	125	133	143	156	170	183	117		
124	185	212	230	244	257	270	284	297	320	338	365	253	1.6	77
51	85	100	110	118	125	132	140	147	160	170	185	123		
124	172	198	214	228	243	257	273	293	316	338	356	243	2.0	78
51	78	92	101	109	117	125	134	145	158	170	180	117		
142	203	221	234	244	252	266	280	295	316	338	363	255	1.5	79
61	95	105	112	118	122	130	138	146	158	170	184	124		
140	194	216	230	246	262	279	298	320	347	372	399	266	1.2	80
60	90	102	110	119	128	137	148	160	175	189	204	130		
106	158	183	205	225	239	257	275	298	327	354	365	239	2.5	81
41	70	84	96	107	115	125	135	148	164	179	185	115		
108	162	190	212	230	248	264	280	300	329	358	374	244	2.0	82
42	72	88	100	110	120	129	138	149	165	181	190	118		
142	192	210	223	235	248	261	277	298	325	351	381	253	2.0	83
61	89	99	106	113	120	127	136	148	163	177	194	123		

TABLE 17.—*Marketing and analytical data for gasolines*
MASSACHUSETTS—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price (cents per gallon).		Color.	Odor.	Unsaturation (percent).	Doctor test.	Gravity.	
				Retail.	Tank wagon.					Specific gravity.	Degrees Baumé.
84	New Bedford.....	2	F.	26	.....	W. W.	O. K....	1—	—	0.741	58.9
85	do.....	5	G.	27	.....	W. W.	O. K....	6.0	+	.742	58.7
86	do.....	1	G.	27	.....	S. Y.	O. K....	2.0	—	.750	56.7
87	do.....	2	F.	27	.....	B. T.	{ Like kerosene. }	2.0	—	.744	58.2
88	do.....	1	G.	28	.....	W. W.	O. K....	1—	—	.750	56.7
89	do.....	5	G.	27	.....	Y. T.	O. K....	2.0	+	.737	60.0
90	Taunton.....	1	T.	.....	25	W. W.	O. K....	1—	—	.745	57.9

MICHIGAN.

91	Detroit.....	3	F.	19½	.....	W. W.	Aromatic	6.0	—	0.748	57.2
92	do.....	142	F.	20	.....	W. W.	O. K....	1—	—	.749	56.9
93	do.....	125	F.	20	.....	W. W.	O. K....	1—	—	.738	59.7
94	do.....	112	F.	20	.....	W. W.	O. K....	1—	—	.744	58.2
95	do.....	117	F.	21	.....	W. W.	O. K....	1—	—	.742	58.7

MISSOURI.

96	St. Louis.....	24	R.	.....	.....	Y. T.	Cracked.	10.0	—	0.780	49.5
97	do.....	3	F.	18.4	18.4	S. Y..	Good....	3.5	±	.749	56.9
98	do.....	1	F.	19.5	18.4	W. W.	Good....	1—	—	.736	60.2
99	do.....	9	F.	19.5	18.4	W. W.	Good....	1—	—	.740	59.2
100	do.....	9	F.	21.5	20.4	W. W.	Good....	1—	—	.722	63.9
101	do.....	9	F.	18.4	18.4	W. W.	Good....	1—	—	.744	58.2
102	do.....	9	D.	23.0	21.9	W. W.	Good....	1—	—	.712	66.6
103	do.....	215	F.	21.4	.....	W. W.	Good....	1—	—	.740	59.2

collected in the 1917 survey, arranged by States—Continued.

MASSACHUSETTS—Continued.

Distillation.														Sample No.
Initial boiling point.	10 per cent mark.	20 per cent mark.	30 per cent mark.	40 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	Dry point.	Average boiling point.	Distillation loss (per cent).	
{ 124 51	169 76	194 90	212 100	230 110	244 118	261 127	279 137	302 150	334 168	363 184	387 197	248 120	1.5	84
{ 118 48	167 75	194 90	216 102	234 112	250 121	266 130	284 140	302 150	329 165	360 182	383 195	250 121	1.5	85
{ 126 52	189 87	228 109	239 115	264 129	266 130	288 142	306 152	324 162	356 180	392 200	410 210	271 133	2.0	86
{ 124 51	176 80	203 95	221 105	237 114	246 119	266 130	284 140	304 151	334 168	374 190	396 202	253 123	2.5	87
{ 135 57	192 89	217 103	237 114	250 121	266 130	279 137	298 148	318 159	349 176	383 195	424 218	270 132	2.2	88
{ 120 49	178 81	203 95	221 105	239 115	253 123	271 133	289 143	306 152	334 168	365 185	388 198	253 123	2.0	89
{ 122 50	167 75	194 90	212 100	230 110	246 119	262 128	280 138	302 150	329 165	352 178	363 184	246 119	1.9	90

MICHIGAN.

{ 108 42	190 88	217 103	237 114	255 124	261 127	291 144	309 154	329 165	356 180	383 195	415 213	270 132	0.5	91
{ 118 48	194 90	217 103	234 112	248 120	262 128	280 138	304 151	329 165	372 189	417 214	448 231	273 134	1.0	92
{ 154 68	203 95	221 105	228 109	239 115	252 122	268 131	284 140	304 151	343 173	378 192	419 215	266 130	.5	93
{ 131 55	189 87	203 95	217 103	235 113	250 121	266 130	282 139	302 150	333 167	363 184	397 203	255 124	1.0	94
{ 136 58	194 90	210 99	223 106	235 113	248 120	264 129	279 137	302 150	333 167	363 184	401 205	257 125	.5	95

MISSOURI.

{ 178 81	244 118	266 130	282 139	297 147	307 153	322 161	334 168	347 175	367 186	388 198	406 208	304 151	1.0	96
{ 102 39	158 70	212 100	248 120	273 134	297 147	318 159	338 170	363 184	410 210	.....	464 240	291 144	2.0	97
{ 118 48	174 79	198 92	216 102	230 110	244 118	261 127	277 136	298 148	327 164	352 178	376 191	248 120	1.0	98
{ 126 52	181 83	203 95	221 105	237 114	252 122	270 132	288 142	316 158	356 180	401 205	435 224	262 128	1.0	99
{ 126 52	167 75	183 84	192 89	201 94	212 106	223 106	244 118	252 122	289 143	327 164	369 187	223 106	1.5	100
{ 133 56	194 90	214 101	230 110	243 117	257 125	264 129	293 145	318 159	354 179	399 204	430 221	266 130	1.0	101
{ 108 42	145 63	162 72	174 79	187 86	198 92	210 99	225 107	239 115	280 138	320 160	352 178	207 97	1.5	102
{ 133 56	189 87	205 96	217 103	230 110	241 116	255 124	273 134	295 146	329 165	365 185	401 205	252 122	1.0	103

TABLE 17.—*Marketing and analytical data for gasolines*

MISSOURI—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price (cents per gallon).		Color.	Odor.	Unsaturation (per cent.).	Doctor test.	Gravity.	
				Retail.	Tank wagon.					Specific gravity.	Degrees Baumé.
104	St. Louis.....	215	F.	22.9	.....	W. W.	Good....	1—	—	0.731	61.5
105	do.....	99	F.	21.5	19.4	W. W.	Good....	1—	—	.736	60.2
106	do.....	136	F.	19.5	18.4	W. W.	Cracked.	3.0	±	.752	56.2
107	Kansas City.....	181	F.	18.3	18.3	W. W.	Good....	1—	+	.742	58.7
108	do.....	63	G.	18.3	18.3	Y. T.	Good....	1—	+	.742	58.7
109	do.....	3	F.	18.3	18.3	W. W.	Cracked.	4.0	+	.744	58.2
110	do.....	134	F.	18.3	18.3	W. W.	Good....	1—	—	.744	58.2
111	do.....	41	R.	.....	.....	W. W.	Good....	1—	±	.742	58.7
112	do.....	245	F.	18.3	18.3	W. W.	Good....	1—	—	.740	59.2
113	do.....	8	F.	21.5	.....	W. W.	Good....	1—	—	.738	59.7
114	do.....	52	F.	18.3	18.3	W. W.	Good....	1—	+	.743	58.4
115	do.....	152	F.	18.3	18.3	Y. T.	Good....	1—	—	.689	73.2
116	do.....	4	F.	18.3	18.3	W. W.	O. K....	1—	±	.742	58.7
117	do.....	45	G.	20.0	18.3	W. W.	O. K....	1—	—	.749	56.9
118	do.....	181	F.	18.3	18.3	W. W.	O. K....	1—	+	.742	58.7

MONTANA.

119	Belt.....	98	G.	32	.....	W. W.	O. K....	1—	±	0.748	57.2
120	Billings.....	10	F.	30	.....	W. W.	O. K....	1—	±	.747	57.4
121	do.....	10	F.	45	.....	W. W.	O. K....	1—	±	.734	60.7
122	do.....	183	F.	.....	.....	W. W.	O. K....	1—	±	.702	69.4
123	do.....	183	F.	30	.....	W. W.	O. K....	1.0	±	.748	57.2
124	Butte.....	1	F.	30	.....	W. W.	O. K....	2.0	—	.749	56.9
125	do.....	10	F.	30	.....	W. W.	O. K....	1.0	±	.747	57.4

collected in the 1917 survey, arranged by States—Continued.

MISSOURI—Continued.

Distillation.														Sample No.
Initial boiling point.	10 per cent mark.	20 per cent mark.	30 per cent mark.	40 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	Dry point.	Average boiling point.	Distillation loss (per cent).	
{ 124 51	174 79	190 88	203 95	216 102	228 109	243 117	257 125	282 139	315 157	352 178	387 197	237 114	1.0	104
{ 99 37	158 70	187 86	216 102	237 114	261 127	280 138	306 152	333 167	378 192	428 220	446 230	264 129	2.0	105
{ 117 47	190 88	221 105	246 119	266 130	286 141	311 155	331 166	354 179	392 200	433 223	459 237	288 142	1.0	106
{ 104 40	181 83	210 99	228 109	244 118	257 125	280 138	304 151	331 166	376 191	439 226	453 234	270 132	2.5	107
{ 127 53	187 86	207 97	223 106	237 114	252 122	266 130	289 143	313 156	352 178	394 201	426 219	262 128	1.0	108
{ 100 38	162 72	208 98	237 114	259 126	280 138	304 151	327 164	354 179	392 200	437 225	437 225	279 137	2.5	109
{ 122 50	176 80	199 93	216 102	232 111	243 117	270 132	298 148	331 166	385 196	439 226	453 234	266 130	1.0	110
{ 167 75	210 99	223 106	241 116	241 116	253 123	264 129	280 138	295 146	322 161	345 174	378 192	261 127	1.0	111
{ 138 59	190 88	207 97	217 103	228 109	235 113	243 117	261 127	275 135	297 147	318 159	352 178	241 116	1.0	112
{ 140 60	189 87	203 95	214 101	226 108	239 115	248 120	271 133	293 145	325 163	358 181	390 199	248 120	1.0	113
{ 140 60	190 68	208 98	221 105	235 113	248 120	262 128	284 140	309 154	343 173	385 196	417 214	261 127	1.0	114
{ 86 30	111 44	127 53	142 61	156 69	172 78	187 86	203 95	226 108	295 146	..... .....	338 170	187 86	6.0	115
{ 158 70	196 91	208 98	219 104	228 109	239 115	250 121	266 130	284 140	313 156	338 170	369 187	248 120	1.0	116
{ 144 62	198 92	217 103	234 112	250 121	266 130	280 138	306 152	329 165	360 182	397 203	424 218	273 134	1.0	117
{ 115 46	187 86	212 100	230 110	244 118	259 126	277 136	298 148	324 162	365 185	415 213	442 228	268 131	1.5	118

MONTANA.

{ 117 47	171 77	196 91	217 103	232 111	248 120	266 130	286 141	311 155	347 175	381 194	397 203	253 123	1.5	119
{ 124 51	176 80	203 95	221 105	237 114	253 123	273 134	293 145	318 159	351 177	383 195	405 207	259 126	1.5	120
{ 117 47	160 71	176 80	189 87	201 94	216 102	230 110	248 120	273 134	316 158	351 177	381 194	228 109	1.0	121
{ 118 48	149 65	163 73	174 79	185 85	196 91	208 98	221 105	239 115	271 133	302 150	374 190	208 98	1.5	122
{ 126 52	181 83	199 93	217 103	230 110	246 119	262 128	279 137	309 154	352 178	388 198	424 218	257 125	1.0	123
{ 126 52	185 85	210 99	228 109	243 117	257 125	271 133	293 145	324 162	356 180	383 195	406 208	264 129	1.0	124
{ 124 51	172 78	194 90	212 100	230 110	246 119	266 130	288 142	311 155	347 175	381 194	399 204	253 123	1.5	125

TABLE 17.—*Marketing and analytical data for gasolines*

MONTANA—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price (cents per gallon).		Color.	Odor.	Unsaturation (per cent).	Doctor test.	Gravity.	
				Retail.	Tank wagon.					Specific gravity.	Degrees Baumé.
126	Helena.....	183	G.	30	.....	W. W.	O. K....	1—	±	0.747	57.4
127	do.....	1	G.	32	.....	W. W.	O. K....	1.0	±	.747	57.4
128	do.....	1	G.	32	.....	W. W.	O. K....	1.0	±	.748	57.2
129	Red Lodge.....	10	G.	33	.....	W. W.	O. K....	5.0	±	.747	57.4
130	Washoe.....	10	F.	35	.....	W. W.	O. K....	2.0	±	.748	57.2

NEVADA.

131	Aurora.....	13	G.	40	.....	Y. T..	O. K....	1—	—	0.750	56.7
132	do.....	13	F.	40	.....	W. W.	O. K....	1—	±	.752	56.2
133	Goldfield.....	13	F.	17	.....	W. W.	Like kerosene.	1—	—	.785	48.3
134	do.....	13	F.	30	.....	W. W.	O. K....	1—	—	.748	57.2

NEW YORK.

135	Batavia.....	5	G.	25	.....	W. W.	O. K....	3.0	+	0.743	58.4
136	do.....	163	G.	25	.....	W. W.	O. K....	1—	—	.736	60.2
137	Rochester.....	182	F.	27	.....	W. W.	O. K....	1—	—	.741	58.9
138	do.....	237	F.	27	.....	Y. T..	Like kerosene.	1—	±	.733	61.0
139	do.....	5	F.	27	.....	W. W.	O. K....	1—	—	.732	61.3
140	Buffalo.....	112	F.	25	.....	W. W.	Good....	1—	+	.743	58.4
141	do.....	226	F.	25	.....	W. W.	Good....	1—	—	.735	60.5
142	do.....	196	F.	29	.....	W. W.	Good....	1—	+	.723	63.6

OHIO.

143	Carrollton.....	22	G.	26	.....	W. W.	O. K....	1—	—	0.744	58.2
144	Cleveland.....	29	F.	23	22	W. W.	O. K....	3.0	—	.751	56.4

collected in the 1917 survey, arranged by States—Continued.

MONTANA—Continued.

Distillation.														Sample No.
Initial boiling point.	10 per cent mark.	20 per cent mark.	30 per cent mark.	40 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	Dry point.	Average boiling point.	Distillation loss (per cent).	
{ 144 62	210 99	226 108	239 115	253 123	268 131	284 140	302 150	327 164	360 182	390 199	414 212	275 135	1.0	126
{ 124 51	181 83	208 98	226 108	243 117	257 125	277 136	295 146	320 160	352 178	388 198	405 207	261 127	1.5	127
{ 117 47	174 79	201 94	219 104	235 113	253 123	270 132	288 142	311 155	345 174	378 192	399 204	255 124	2.0	128
{ 124 51	176 80	203 95	221 105	237 114	253 123	271 133	293 145	315 157	347 175	381 194	399 204	259 126	1.0	129
{ 117 47	172 78	199 93	221 105	239 115	257 125	275 135	293 145	318 159	351 177	379 193	405 207	259 126	1.5	130

NEVADA.

{ 122 50	171 77	194 90	210 99	223 106	237 114	246 119	270 132	291 144	324 162	356 180	383 195	243 117	1.5	131
{ 122 50	171 77	192 89	207 97	221 105	235 113	248 120	266 130	288 142	318 159	351 177	374 190	241 116	1.0	132
{ 189 87	239 115	252 122	259 126	268 131	277 136	288 142	298 148	306 152	338 170	367 186	388 198	282 139	1.0	133
{ 138 59	178 81	189 87	196 91	207 97	212 100	221 105	232 111	246 119	270 132	297 147	329 165	219 104	1.5	134

NEW YORK.

{ 131 55	185 85	208 98	226 108	241 116	253 123	270 132	288 142	307 153	333 167	356 180	383 195	257 125	1.5	135
{ 138 59	185 85	208 98	225 107	239 115	255 124	270 132	282 139	309 154	334 168	360 182	376 191	257 125	1.5	136
{ 129 54	176 80	203 95	219 104	234 112	244 118	257 125	277 136	300 149	329 165	374 190	390 199	252 122	1.9	137
{ 127 53	176 80	199 93	208 98	228 109	239 115	250 121	262 128	280 138	306 152	329 165	352 178	239 115	1.6	138
{ 140 60	189 87	207 97	221 105	230 110	241 116	248 120	266 130	284 140	306 152	329 165	365 185	244 118	1.5	139
{ 126 52	189 87	210 99	228 109	244 118	262 128	280 138	304 151	329 165	365 185	397 203	439 226	270 132	1.0	140
{ 108 42	169 76	189 87	205 96	217 103	230 110	244 118	262 128	280 138	316 158	347 175	374 190	235 113	1.5	141
{ 111 44	163 73	181 83	196 91	208 98	223 106	237 114	253 123	277 136	315 157	349 176	405 207	234 112	1.0	142

OHIO.

{ 111 44	156 69	194 90	228 109	252 122	273 134	297 147	318 159	343 173	383 195	414 212	414 212	270 132	4.0	143
{ 131 55	198 92	212 100	228 109	243 117	257 125	273 134	289 143	315 157	349 176	392 200	432 222	266 130	2.0	144

TABLE 17.—*Marketing and analytical data for gasolines*

OHIO—Continued.

Sample No.	City.	Company No.	Sample collected from—	Price (cents per gallon).		Color.	Odor.	Unsaturation (per cent).	Doctor test.	Gravity.	
				Retail.	Tank wagon.					Specific gravity.	Degrees Baumé.
145	Cleveland.....	86	F.	24	22	W. W.	O. K....	1—	±	0.770	51.8
146	do.....	141	F.	24	22	W. W.	O. K....	2.0	+	.746	57.7
147	do.....	106	F.	24	22	Y. T..	O. K....	4.0	+	.744	58.2
148	do.....	8	F.	27	.....	W. W.	O. K....	1—	—	.744	58.2
149	do.....	32	F.	24	22	W. W.	O. K....	3.0	±	.736	60.2
150	do.....	22	F.	24	22	B. T..	O. K....	1.5	±	.741	58.9
151	Cincinnati.....	158	G.	24	22	W. W.	O. K....	1—	—	.738	59.7
152	do.....	177	F.	24	22	W. W.	O. K....	3.0	±	.740	59.2
153	do.....	189	F.	24	22	W. W.	O. K....	1—	—	.739	59.4
154	do.....	22	F.	24	22	W. W.	O. K....	3.0	±	.742	58.7
155	do.....	114	F.	24	22	W. W.	O. K....	1—	±	.740	59.2
156	do.....	184	F.	24	22	W. W.	O. K....	1—	—	.741	58.9
157	do.....	184	F.	30	28	W. W.	O. K....	1—	—	.713	66.4
158	do.....	67	G.	24	22	W. W.	O. K....	1—	±	.736	60.2
159	do.....	91	F.	25	23	W. W.	O. K....	1—	—	.724	63.4
160	Columbus.....	184	F.	24	22	W. W.	O. K....	1—	+	.747	57.4
170	do.....	184	F.	30	28	W. W.	O. K....	1—	+	.722	63.9
171	do.....	22	F.	24	22	W. W.	Cracked.	3.0	—	.742	58.7
172	do.....	8	F.	27	.....	W. W.	O. K....	1—	—	.737	60.0
173	do.....	224	F.	23	22	Y. T..	Like kerosene.	1—	+	.744	58.2
174	do.....	190	F.	29	.....	W. W.	O. K....	1—	—	.745	57.9
175	do.....	190	F.	24	.....	W. W.	O. K....	1—	+	.735	60.5
176	do.....	113	F.	24	22	W. W.	O. K....	1—	—	.745	57.9
177	Scroggsfield.....	39	F.	26	.....	W. W.	O. K....	1—	—	.728	62.3

collected in the 1917 survey, arranged by States—Continued.

OHIO—Continued.

Distillation.														Sample No.
Initial boiling point.	10 per cent mark.	20 per cent mark.	30 per cent mark.	40 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	Dry point.	Average boiling point.	Distillation loss (per cent).	
{ 162 72 }	223 106	235 113	244 118	252 122	261 127	271 133	286 141	300 149	327 164	358 181	383 195	268 131	{ 1.5 }	145
{ 149 65 }	205 96	228 109	244 118	259 126	273 134	289 143	306 152	325 163	354 179	396 202	423 217	279 137	{ 1.2 }	146
{ 147 64 }	192 89	214 101	230 110	244 118	259 126	275 135	289 143	311 155	342 172	374 190	399 204	264 129	{ 1.5 }	147
{ 126 52 }	180 82	208 98	226 108	246 119	264 129	284 140	300 149	325 163	356 180	385 196	399 204	264 129	{ 1.5 }	148
{ 136 58 }	185 85	201 94	214 101	225 107	237 114	250 121	266 130	286 141	315 157	343 173	374 190	244 118	{ 1.5 }	149
{ 129 54 }	178 81	203 95	221 105	237 114	252 122	266 130	286 141	306 152	336 169	367 186	388 198	255 124	{ 1.7 }	150
{ 126 52 }	185 85	205 96	221 105	235 113	250 121	262 128	284 140	306 152	340 171	378 192	419 215	257 125	{ 1.0 }	151
{ 122 50 }	189 87	212 100	228 109	241 116	257 125	275 135	291 141	309 154	333 167	361 183	387 197	259 126	{ 2.0 }	152
{ 122 50 }	189 87	207 97	221 105	237 114	250 121	268 131	282 139	307 153	340 171	376 191	415 213	259 126	{ 1.5 }	153
{ 104 40 }	167 75	192 89	228 109	257 125	279 137	304 151	324 162	349 176	387 197	401 205	424 218	273 134	{ 3.0 }	154
{ 131 55 }	185 85	203 95	217 103	232 111	246 119	262 128	282 139	306 152	338 170	370 188	406 208	255 124	{ 1.0 }	155
{ 126 52 }	189 87	216 102	234 112	248 120	264 129	284 140	302 150	325 163	363 184	403 206	424 218	271 133	{ 1.5 }	156
{ 100 38 }	140 60	160 71	176 80	192 89	205 96	219 104	237 114	257 125	298 148	336 169	360 182	214 101	{ 2.0 }	157
{ 127 53 }	189 87	208 98	226 108	243 117	259 126	277 136	297 147	320 160	349 176	383 195	401 205	262 128	{ 1.5 }	158
{ 126 52 }	183 84	198 92	210 99	221 105	232 111	244 118	252 122	275 135	302 150	327 164	358 181	237 118	{ 1.0 }	159
{ 129 54 }	192 89	214 101	230 110	244 118	257 125	275 135	291 144	311 155	347 175	381 194	419 215	264 129	{ 1.0 }	160
{ 104 40 }	151 66	171 77	187 86	201 94	216 102	230 110	248 120	270 132	306 152	338 170	374 190	223 106	{ 1.5 }	170
{ 102 39 }	167 75	194 90	228 109	257 125	279 137	297 147	325 163	354 179	392 200	..... .....	430 221	275 135	{ 4.5 }	171
{ 108 42 }	160 71	183 84	203 95	221 105	237 114	257 125	277 136	304 151	340 171	374 190	396 202	244 118	{ 1.5 }	172
{ 140 60 }	194 90	212 100	223 106	237 114	252 122	268 131	288 142	311 155	351 177	387 197	397 203	261 127	{ 2.0 }	173
{ 138 59 }	201 94	217 103	230 110	244 118	257 125	271 133	280 138	306 152	329 165	347 175	365 185	259 126	{ 1.0 }	174
{ 117 47 }	187 86	217 103	237 114	252 122	275 135	302 160	320 160	345 174	379 193	419 215	425 224	279 137	{ 2.0 }	175
{ 113 45 }	167 75	199 93	223 106	241 116	264 129	289 143	311 155	338 170	390 199	455 235	482 250	273 134	{ 2.0 }	176
{ 131 55 }	176 80	194 90	212 100	226 108	241 116	257 125	280 138	311 155	360 182	426 219	437 225	257 125	{ 1.5 }	177

TABLE 17.—*Marketing and analytical data for gasolines*

OKLAHOMA.

Sample No.	City.	Company No.	Sample collected from—	Price (cents per gallon).		Color.	Odor.	Unsaturation (percent).	Doctor test.	Gravity.	
				Retail.	Tank wagon.					Specific gravity.	Degrees Baumé.
178	Bigheart.....	32	R.	.....	.....	W. W.	O. K....	1—	—	0.746	57.7
179	do.....	32	R.	.....	.....	W. W.	O. K....	1—	±	.736	60.2
180	Chelsea.....	31	R.	.....	.....	W. W.	O. K....	1—	±	.742	58.7
181	do.....	31	R.	.....	.....	W. W.	O. K....	1—	±	.742	58.7
182	Tulsa.....	9	F.	24	22	W. W.	O. K....	1—	—	.743	58.4
183	do.....	33	R.	.....	.....	W. W.	Good....	1—	—	.732	61.3
184	do.....	32	R.	.....	.....	Y.....	O. K....	1—	—	.736	60.2
185	do.....	65	R.	.....	.....	W. W.	O. K....	1—	±	.742	58.7
186	do.....	69	F.	24	22	W. W.	O. K....	1—	—	.734	60.7
187	do.....	250	G.	25	22	W. W.	O. K....	1—	—	.737	60.0
188	do.....	79	F.	24	22	W. W.	O. K....	1—	±	.732	61.3
189	do.....	1	F.	24	22	W. W.	O. K....	1—	—	.738	59.7
189a	do.....	225	F.	25	.....	W. W.	O. K....	1—	—	.735	60.5
190	do.....	15	F.	24	22	W. W.	O. K....	1—	—	.737	60.0
191	do.....	32	R.	.....	.....	W. W.	O. K....	1—	—	.707	68.0

PENNSYLVANIA.

192	Pittsburgh.....	18	F.	27	.....	W. W.	Good....	1—	±	0.723	63.6
193	do.....	18	F.	32	.....	W. W.	Good....	1—	±	.686	74.1
194	do.....	61	F.	32	.....	W. W.	Good....	1—	±	.691	72.6
195	do.....	168	F.	28	.....	W. W.	Good....	1—	±	.725	63.1
196	do.....	168	F.	25	.....	W. W.	Good....	1—	±	.730	61.8
197	do.....	132	F.	27	.....	W. W.	Good....	4.0	—	.708	67.7
198	do.....	2	F.	27	.....	W. W.	Good....	1—	±	.720	64.4

collected in the 1917 survey, arranged by States—Continued.

OKLAHOMA.

Distillation.														Sample No.
Initial boiling point.	10 percent mark.	20 percent mark.	30 percent mark.	40 percent mark.	50 percent mark.	60 percent mark.	70 percent mark.	80 percent mark.	90 percent mark.	95 percent mark.	Dry point.	Average boiling point.	Distillation loss (percent).	
{ 122 50	192 89	210 99	223 106	235 113	250 121	259 126	280 138	300 149	329 165	363 184	396 202	255 124	1.5	178
{ 122 50	176 80	194 90	207 97	219 104	230 110	243 117	262 128	282 139	313 156	340 171	372 189	239 115	1.5	179
{ 122 50	180 82	187 86	194 90	203 95	210 99	219 104	230 110	239 115	266 130	288 142	320 160	214 101	1.0	180
{ 135 57	178 81	187 86	196 91	203 95	212 100	221 105	232 111	244 118	268 131	289 143	322 161	217 103	1.0	181
{ 120 49	180 82	207 97	225 107	243 117	257 125	277 136	298 148	324 162	365 185	406 208	415 213	264 129	1.0	182
{ 118 48	172 78	194 90	210 99	225 107	239 115	253 123	270 132	293 145	322 161	352 178	379 193	243 117	1.5	183
{ 120 49	156 69	194 90	210 99	221 105	241 116	257 125	270 132	291 144	322 161	352 178	381 194	243 117	1.0	184
{ 131 55	189 87	212 100	228 109	243 117	259 126	275 135	293 145	306 152	338 170	360 182	387 197	261 127	1.0	185
{ 133 56	189 87	203 95	223 106	226 108	234 112	244 118	261 127	277 136	304 151	329 165	360 182	241 116	1.5	186
{ 126 52	180 82	199 93	212 100	225 107	235 113	248 120	282 139	284 140	313 156	338 170	367 186	243 117	1.0	187
{ 122 50	160 71	189 87	203 95	216 102	230 110	246 119	266 130	289 143	322 161	352 178	383 195	239 115	1.0	188
{ 122 50	174 79	199 93	216 102	232 111	248 120	253 123	280 138	304 151	331 166	356 180	379 193	250 121	1.5	189
{ 126 52	185 85	203 95	212 100	223 106	232 111	244 118	257 125	277 136	304 151	334 168	356 180	237 114	2.0	189a
{ 122 50	180 82	201 94	214 101	225 107	237 114	250 121	264 129	284 140	311 155	338 170	363 184	241 116	1.0	190
{ 104 40	136 58	153 67	165 74	176 80	189 87	201 94	216 102	230 110	261 127	300 149	334 168	198 92	2.0	191

PENNSYLVANIA.

{ 120 49	171 77	190 88	207 97	223 106	241 116	257 125	279 137	302 150	342 172	396 202	396 202	248 120	3.0	192
{ 91 33	122 50	140 60	154 68	167 75	178 81	192 89	203 95	223 106	255 124	300 149	313 156	185 85	2.0	193
{ 86 30	126 52	144 62	162 72	178 81	194 90	212 100	232 111	264 129	327 164	383 195	394 201	210 99	2.5	194
{ 122 50	189 87	199 93	212 100	223 106	234 112	244 118	257 125	279 137	309 154	336 169	376 191	241 116	1.0	195
{ 147 64	187 86	207 97	219 104	232 111	237 114	259 126	273 134	293 146	325 163	363 184	388 198	252 122	2.0	196
{ 79 26	122 50	158 70	192 89	226 108	248 120	268 131	286 141	307 153	356 180	..... .....	372 189	237 114	3.0	197
{ 117 47	174 79	194 90	210 99	225 107	239 115	253 123	270 132	295 146	334 168	365 185	399 204	246 119	2.0	198

TABLE 17.—Marketing and analytical data for gasolines

PENNSYLVANIA Continued.

Sample No.	City.	Company No.	Sample collected from	Price (cents per gallon).		Color.	Odor.	Unsaturation (per cent).	Doctor test.	Gravity.	
				Retail.	Tank wagon.					Specific gravity.	Degrees Baumé.
199	Pittsburgh.....	202	F.	25	.....	W. W.	Good....	1—	±	0.726	62.8
200	do.....	119	F.	28	.....	W. W.	Good....	3.0	±	.724	63.4
201	do.....	2	G.	27	.....	W. W.	Good....	1—	±	.725	63.1
202	do.....	18	R.	.....	.....	W. W.	Good....	.....	.....	.729	62.0
203	do.....	202	D.	.....	.....	W. W.	O. K....	1—	±	.731	61.5
204	do.....	202	D.	.....	.....	W. W.	O. K....	1—	—	.684	74.7

TENNESSEE.

205	Nashville.....	6	F.	23	21	W. W.	O. K....	1—	+	0.743	58.4
206	do.....	2	F.	23	21	W. W.	O. K....	1—	—	.734	60.7
207	do.....	235	G.	23	21	W. W.	O. K....	1—	+	.745	57.9
208	do.....	17	F.	25	23	W. W.	O. K....	1—	—	.739	59.4
209	do.....	6	F.	23	21	Y. T..	O. K....	1—	+	.742	58.7
210	do.....	50	G.	23	21	W. W.	O. K....	1—	±	.743	58.4
211	do.....	6	F.	23	21	W. W.	O. K....	1—	+	.743	58.4
212	do.....	42	R.	.....	.....	W. W.	O. K....	1—	—	.749	56.9

TEXAS.

213	Dallas.....	1	F.	22	21	W. W.	O. K....	1—	—	0.745	57.9
214	do.....	2	F.	22	21	W. W.	O. K....	1—	—	.738	59.7
215	do.....	15	F.	22	21	W. W.	O. K....	1—	±	.738	59.7
216	do.....	64	F.	22	21	W. W.	O. K....	1—	+	.751	56.4
217	do.....	9	F.	22	21	W. W.	O. K....	1—	—	.748	57.2
218	El Paso.....	141	F.	27	.....	W. W.	Good....	1—	—	.735	60.5

collected in the 1917 survey, arranged by States—Continued.

PENNSYLVANIA—Continued.

Distillation.													Sample No.
Initial boiling point.	10 per cent mark.	20 per cent mark.	30 per cent mark.	40 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	Dry point.	Average boiling point.	
{ 93 34	{ 138 59	{ 162 72	{ 190 88	{ 216 102	{ 239 115	{ 259 126	{ 277 136	{ 297 147	{ 334 168	{	{ 401 205	{ 237 114	{ 3.0 199
{ 90 32	{ 145 63	{ 194 90	{ 234 112	{ 259 126	{ 266 130	{ 302 150	{ 316 158	{ 336 169	{ 370 188	{ 392 200	{ 401 205	{ 264 129	{ 2.5 200
{ 122 50	{ 183 84	{ 199 93	{ 212 100	{ 226 108	{ 239 115	{ 253 123	{ 270 132	{ 291 144	{ 324 162	{ 354 179	{ 397 203	{ 246 119	{ 1.0 201
{ 153 67	{ 180 82	{ 205 96	{ 221 105	{ 235 113	{ 248 120	{ 261 127	{ 279 137	{ 300 149	{ 333 167	{ 365 185	{ 408 209	{ 257 125	{ 1.0 202
{ 115 46	{ 171 77	{ 194 90	{ 212 100	{ 230 110	{ 244 118	{ 261 127	{ 277 136	{ 295 146	{ 324 162	{ 360 182	{ 390 199	{ 246 119	{ 1.6 203
{ 90 32	{ 108 42	{ 120 49	{ 136 58	{ 156 69	{ 178 81	{ 205 96	{ 232 111	{ 262 128	{ 315 157	{	{ 390 190	{ 199 93	{ 5.0 204

TENNESSEE.

{ 118 48	{ 180 82	{ 201 94	{ 219 104	{ 234 112	{ 250 121	{ 268 131	{ 284 140	{ 311 157	{ 345 174	{ 381 194	{ 410 210	{ 257 125	{ 1.0 205
{ 115 46	{ 172 78	{ 194 90	{ 210 99	{ 225 107	{ 239 115	{ 252 122	{ 273 134	{ 286 141	{ 329 165	{ 365 185	{ 394 201	{ 243 117	{ 1.0 206
{ 118 48	{ 180 82	{ 203 95	{ 219 104	{ 235 113	{ 253 123	{ 273 134	{ 293 145	{ 329 165	{ 374 190	{ 421 216	{ 464 240	{ 268 131	{ 1.0 207
{ 131 55	{ 198 92	{ 228 109	{ 228 109	{ 239 115	{ 252 122	{ 255 124	{ 268 131	{ 289 143	{ 322 161	{ 342 172	{ 358 181	{ 252 122	{ 2.0 208
{ 122 50	{ 181 83	{ 205 96	{ 221 105	{ 237 114	{ 252 122	{ 268 131	{ 286 141	{ 313 156	{ 349 176	{ 383 195	{ 405 207	{ 259 126	{ 2.0 209
{ 106 41	{ 167 75	{ 205 96	{ 223 106	{ 239 115	{ 257 125	{ 271 133	{ 291 144	{ 334 168	{ 385 196	{ 432 222	{ 457 236	{ 266 130	{ 1.5 210
{ 122 50	{ 183 84	{ 203 95	{ 221 105	{ 235 113	{ 250 121	{ 257 125	{ 288 142	{ 311 155	{ 347 175	{ 383 195	{ 419 215	{ 257 125	{ 1.5 211
{ 126 52	{ 180 82	{ 198 92	{ 214 101	{ 226 108	{ 241 116	{ 259 126	{ 275 135	{ 302 150	{ 331 166	{ 365 185	{ 387 197	{ 248 120	{ 1.0 212

TEXAS.

{ 129 54	{ 196 91	{ 217 103	{ 232 111	{ 246 119	{ 252 122	{ 275 135	{ 291 144	{ 311 155	{ 338 170	{ 358 181	{ 390 199	{ 262 128	{ 2.0 213
{ 117 47	{ 176 80	{ 199 93	{ 216 102	{ 230 110	{ 243 117	{ 261 127	{ 279 137	{ 302 150	{ 336 169	{ 369 187	{ 401 205	{ 252 122	{ 1.5 214
{ 120 49	{ 183 84	{ 205 96	{ 223 104	{ 237 114	{ 250 121	{ 266 130	{ 286 141	{ 306 152	{ 338 170	{ 367 186	{ 399 214	{ 255 124	{ 1.5 215
{ 136 58	{ 194 90	{ 208 98	{ 223 106	{ 234 112	{ 246 119	{ 261 127	{ 275 135	{ 293 145	{ 318 159	{ 342 172	{ 363 184	{ 250 121	{ 1.0 216
{ 145 63	{ 194 90	{ 212 100	{ 226 108	{ 239 115	{ 255 124	{ 271 133	{ 288 142	{ 316 158	{ 354 179	{ 392 200	{ 437 225	{ 268 131	{ 1.0 217
{ 95 35	{ 131 55	{ 165 74	{ 198 92	{ 230 110	{ 253 123	{ 273 134	{ 298 148	{ 320 160	{ 356 180	{	{ 410 210	{ 248 120	{ 2.2 218

TABLE 17.—*Marketing and analytical data for gasolines*

TEXAS—Continued.

Sample No.	City.	Company No.	Sample collected from	Price (cents per gallon).		Color.	Odor.	Unsaturation (per cent).	Doctor test.	Gravity.	
				Retail.	Tank wagon.					Specific gravity.	Degrees Baumé.
219	El Paso.....	141	F.	24	.....	W. W.	Good....	1—	—	0.753	55.9
220	Fort Worth.....	9	F.	22	21	W. W.	O. K....	1—	—	.751	56.4
221	do.....	1	G.	22	21	W. W.	O. K....	1—	—	.752	56.2
222	do.....	90	F.	21	.....	W. W.	O. K....	1—	±	.735	60.5
223	do.....	15	F.	22	21	W. W.	O. K....	1—	—	.737	60.0
224	do.....	2	F.	22	21	W. W.	O. K....	1—	±	.741	58.9
225	do.....	71	F.	22	21	W. W.	O. K....	1—	—	.742	58.7
226	do.....	71	F.	21	20	W. W.	O. K....	1—	—	.765	53.0
227	Galveston.....	15	F.	23	21	W. W.	O. K....	1—	—	.713	58.4
228	do.....	9	F.	23	21	W. W.	O. K....	1—	—	.742	58.7
229	do.....	2	F.	23	21	W. W.	O. K....	1—	±	.739	59.4
230	do.....	1	G.	23	21	W. W.	O. K....	1—	—	.740	59.2
231	Houston.....	1	F.	22	21	Blue cast.	O. K....	1—	—	.749	56.9
232	do.....	15	F.	22	21	W. W.	O. K....	1—	—	.744	58.2
233	do.....	161	F.	22	21	W. W.	O. K....	1—	—	.751	56.4
234	do.....	2	F.	22	21	W. W.	O. K....	1—	±	.740	59.2
235	do.....	9	F.	22	21	W. W.	O. K....	1—	—	.740	59.2
236	do.....	102	F.	22	21	W. W.	O. K....	1—	—	.733	61.0
237	do.....	43	F.	22	21	W. W.	O. K....	1—	—	.746	57.7

UTAH.

238	Pinckala.....	10	G.	33	.....	W. W.	O. K....	1—	—	0.758	54.7
239	do.....	10	G.	33	.....	W. W.	O. K....	3.0	±	.751	55.4
240	Helper.....	10	F.	34	.....	W. W.	Cracked.	5.0	—	.751	55.4

collected in the 1917 survey, arranged by States—Continued.

TEXAS—Continued.

Distillation.														Sample No.
Initial boiling point.	10 per cent mark.	20 per cent mark.	30 per cent mark.	40 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	Dry point.	Average boiling point.	Distillation loss (per cent).	
{ 118 48	{ 187 86	{ 217 103	{ 235 113	{ 250 121	{ 264 129	{ 277 136	{ 293 145	{ 311 155	{ 338 170	{ 365 185	{ 383 195	{ 261 127	{ 1.0	219
{ 122 50	{ 185 85	{ 207 97	{ 223 106	{ 239 115	{ 253 123	{ 275 135	{ 298 148	{ 327 164	{ 372 189	{ 419 215	{ 460 238	{ 270 132	{ 1.5	220
{ 126 52	{ 187 86	{ 207 97	{ 216 102	{ 248 120	{ 255 124	{ 284 140	{ 298 148	{ 327 164	{ 365 185	{ 410 210	{ 457 236	{ 270 132	{ 1.0	221
{ 124 51	{ 178 81	{ 198 92	{ 210 99	{ 214 101	{ 235 113	{ 252 122	{ 270 132	{ 289 143	{ 318 159	{ 342 172	{ 367 186	{ 241 116	{ 1.5	222
{ 120 49	{ 174 79	{ 198 92	{ 214 101	{ 228 109	{ 243 117	{ 253 123	{ 277 136	{ 300 149	{ 331 166	{ 365 185	{ 394 201	{ 248 120	{ 1.5	223
{ 104 40	{ 185 85	{ 201 94	{ 217 103	{ 237 114	{ 252 122	{ 273 134	{ 286 141	{ 315 157	{ 345 174	{ 379 193	{ 399 204	{ 255 123	{ 2.0	224
{ 120 49	{ 174 79	{ 194 90	{ 208 98	{ 221 105	{ 232 111	{ 244 118	{ 262 128	{ 280 138	{ 309 154	{ 338 170	{ 363 184	{ 237 114	{ 1.5	225
{ 107 75	{ 228 109	{ 243 117	{ 253 123	{ 262 128	{ 273 134	{ 284 140	{ 298 148	{ 315 157	{ 338 170	{ 361 183	{ 392 200	{ 277 136	{ 1.0	226
{ 117 47	{ 183 84	{ 203 95	{ 228 109	{ 246 119	{ 261 127	{ 275 135	{ 293 145	{ 313 156	{ 338 170	{ 365 185	{ 399 204	{ 259 126	{ 2.0	227
{ 133 56	{ 189 87	{ 210 99	{ 225 107	{ 239 115	{ 253 123	{ 270 132	{ 288 142	{ 311 155	{ 338 170	{ 367 186	{ 397 203	{ 259 126	{ 1.0	228
{ 121 49	{ 187 86	{ 207 97	{ 221 105	{ 234 112	{ 244 118	{ 257 125	{ 275 135	{ 297 147	{ 327 164	{ 356 180	{ 394 201	{ 252 122	{ 1.5	229
{ 111 44	{ 183 84	{ 198 92	{ 225 107	{ 244 118	{ 261 127	{ 280 138	{ 297 147	{ 316 158	{ 345 174	{ 374 190	{ 406 208	{ 261 127	{ 1.5	230
{ 122 50	{ 192 89	{ 216 102	{ 234 112	{ 248 120	{ 262 128	{ 279 137	{ 293 145	{ 313 156	{ 338 170	{ 363 184	{ 396 202	{ 262 128	{ 1.5	231
{ 129 54	{ 189 87	{ 208 98	{ 225 107	{ 237 114	{ 252 122	{ 264 129	{ 279 137	{ 300 149	{ 324 162	{ 352 178	{ 388 198	{ 253 123	{ 1.5	232
{ 129 54	{ 189 87	{ 212 100	{ 230 110	{ 248 120	{ 268 131	{ 289 143	{ 304 151	{ 342 172	{ 379 193	{ 419 215	{ 450 232	{ 277 136	{ 1.0	233
{ 131 55	{ 190 88	{ 208 98	{ 221 105	{ 234 112	{ 257 125	{ 275 135	{ 297 147	{ 311 155	{ 327 164	{ 356 180	{ 396 202	{ 259 126	{ 1.0	234
{ 124 51	{ 192 89	{ 214 101	{ 230 110	{ 244 118	{ 259 126	{ 277 136	{ 295 146	{ 315 157	{ 347 175	{ 374 190	{ 403 206	{ 264 123	{ 1.0	235
{ 129 54	{ 172 78	{ 189 87	{ 201 94	{ 212 100	{ 223 106	{ 241 116	{ 248 120	{ 266 130	{ 298 148	{ 327 164	{ 365 185	{ 239 110	{ 1.5	236
{ 138 59	{ 198 92	{ 217 103	{ 230 110	{ 243 117	{ 255 124	{ 268 131	{ 279 137	{ 300 149	{ 316 158	{ 343 173	{ 370 188	{ 255 124	{ 1.0	237

UTAH.

{ 140 60	{ 192 89	{ 207 97	{ 217 103	{ 226 108	{ 235 113	{ 248 120	{ 262 128	{ 277 136	{ 302 150	{ 331 166	{ 363 184	{ 243 117	{ 1.0	238
{ 135 57	{ 185 85	{ 208 98	{ 223 106	{ 239 115	{ 253 123	{ 270 132	{ 288 142	{ 311 155	{ 347 175	{ 378 192	{ 403 206	{ 261 127	{ 1.0	239
{ 109 43	{ 178 81	{ 212 100	{ 237 114	{ 257 125	{ 275 135	{ 293 145	{ 311 155	{ 333 167	{ 363 184	{ 390 199	{ 406 208	{ 271 133	{ 1.5	240

TABLE 17.—Marketing and analytical data for gasolines

UTAH—continued.

Sample No.	City.	Company No.	Sample collected from	Price (cents per gallon).		Color. ²	Odor.	Unsaturation (per cent).	Dacolor test.	Gravity.	
				Retail.	Tank wagon.					Specific gravity.	Degrees Baumé.
241	Milton	10	F.	40		W. W.	O. K.	3.0	±	0.750	56.7
242	Sandy	10	G.			W. W.	O. K.	3.0	±	.751	56.4
243	Sunnyside	10	F.	35		W. W.	Cracked.	6.0	—	.750	56.7
244	Sal Lake City	10	F.	33		W. W.	O. K.	1—	±	.759	45.5
245	do	100	F.	28		W. W.	O. K.	1—	—	.748	57.2
246	do	100	F.	28		W. W.	O. K.	1—	—	.751	56.4
247	do	121	F.	28		W. W.	O. K.	1—	—	.756	55.2
248	do	121	G.	28		W. W.	O. K.	1—	—	.755	55.4
249	do	100	G.	26		W. W.	O. K.	1—	—	.750	56.7
250	do	10	F.	28		W. W.	O. K.	1—	—	.754	55.7
251	do	100	G.	28		W. W.	O. K.	1—	—	.755	55.4
252	do	100	G.	28		W. W.	O. K.	1—	—	.756	55.2
253	do	121	F.	28		W. W.	O. K.	1—	—	.755	55.4
254	do	121	F.	28		W. W.	O. K.	1—	—	.757	54.9
255	do	100	F.	28		W. W.	O. K.	1—	—	.751	56.4

1. In this column O means "distributing station"; F, "filling station"; G, "garage"; R, "refinery"; S, "service station"; T, "tank wagon"; W, "warehouse"; X, "retail store."

2. W., "clear white"; Y., "yellowish"; S. Y., "slightly yellow"; B. T., "blue tint."

collected in the 1917 survey, arranged by States—Continued.

UTAH—Continued.

Distillation. ³														Distillation loss (per cent).	Sample No. ³
Initial boiling point.	10 per cent mark.	20 per cent mark.	30 per cent mark.	40 per cent mark.	50 per cent mark.	60 per cent mark.	70 per cent mark.	80 per cent mark.	90 per cent mark.	95 per cent mark.	Dry point.	Average boiling point.			
{ 122 50	183 84	207 97	226 108	244 118	266 130	284 140	311 155	338 170	374 190	406 208	430 221	271 133	2.0	241	
{ 118 48	192 89	207 97	226 108	239 115	255 124	270 132	289 143	311 155	347 175	383 195	408 209	261 127			
{ 113 45	169 76	203 95	232 111	255 124	275 135	293 145	316 158	338 170	365 185	394 201	410 210	270 132	1.6	243	
{ 140 60	194 90	208 98	226 108	228 109	235 113	248 120	262 128	279 137	302 150	325 163	363 184	244 118			
{ 111 44	165 74	190 88	207 97	219 104	232 111	246 119	261 127	282 139	313 156	351 177	381 194	237 114	1.7	245	
{ 127 53	183 84	199 93	212 100	221 105	232 111	243 117	248 120	273 134	297 147	324 162	354 179	235 113			
{ 131 55	172 78	190 88	205 96	216 102	225 107	237 114	252 122	268 131	293 145	318 159	343 173	230 110	1.8	247	
{ 129 54	178 81	196 91	208 98	217 103	226 108	237 114	248 120	264 129	286 141	307 153	338 170	230 110			
{ 124 51	169 76	189 87	203 95	216 102	228 109	241 116	257 125	275 135	302 150	331 166	361 183	234 112	1.6	249	
{ 129 54	176 80	194 90	207 97	216 102	226 108	235 113	250 121	266 130	289 143	313 156	331 166	228 109			
{ 144 62	183 84	198 92	208 98	217 103	226 108	237 114	252 122	266 130	291 144	316 158	340 171	234 112	1.5	251	
{ 133 56	180 82	194 90	205 96	217 103	226 108	235 113	252 122	266 130	289 143	315 157	329 165	230 110			
{ 135 57	189 87	205 96	216 102	226 108	235 113	246 119	255 124	277 136	304 151	338 170	351 177	241 116	2.8	253	
{ 135 57	178 81	196 91	207 97	219 104	228 109	241 116	252 122	266 130	289 143	315 157	331 166	232 111			
{ 133 56	176 80	194 90	208 98	219 104	232 111	244 118	259 126	279 137	307 153	340 171	370 188	239 115	1.5	255	

³ For each sample the upper line of figures are in degrees Fahrenheit and the lower line in degrees centigrade.

TABLE 18.—*Data on tests of gasolines collected in the 1917 survey, arranged to show refining practices of different companies.*

LARGE REFINERS AND MARKETERS.

Sample No.	Company No.	Color. ¹	Odor.	Insulation, per cent.	Doctor test.	Gravity.		Distillation. ²					
						Specific gravity.	Degrees Baumé.	Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	Average boiling point.
3	1	W. W.	O. K....	1—	—	0.745	57.9	113 45	216 102	255 124	349 176	403 206	266 130
11	1	W. W.	O. K....	1—	±	.745	57.9	104 40	208 98	268 131	370 188	464 240	273 134
33	1	W. W.	O. K....	2.0	+	.745	57.9	122 50	201 94	257 125	365 185	426 219	266 130
36	1	W. W.	O. K....	2.5	+	.742	58.7	120 49	205 96	262 128	369 187	428 220	268 131
40	1	W. W.	O. K....	1.0	—	.743	58.4	118 48	205 96	259 126	365 185	426 219	266 130
42	1	W. W.	O. K....	4.0	—	.750	56.7	129 54	205 90	261 127	365 185	426 219	264 129
43	1	W. W.	O. K....	3.0	—	.746	57.7	129 54	205 90	244 118	367 186	421 216	264 129
47	1	W. W.	O. K....	1—	—	.737	60.0	106 41	194 90	261 127	347 175	396 202	255 124
49	1	W. W.	O. K....	1—	—	.737	60.0	120 49	201 94	250 121	340 171	392 200	255 124
66	1	W. W.	O. K....	1—	—	.743	58.4	113 45	207 97	266 130	347 175	201 205	264 129
70	1	W. W.	O. K....	4.0	—	.741	58.9	104 40	194 90	264 129	331 166	372 189	253 123
86	1	S. Y..	O. K....	2.0	—	.750	56.7	126 52	228 109	266 130	356 180	410 210	271 133
88	1	W. W.	O. K....	1—	—	.750	56.7	135 57	217 103	266 130	349 176	424 218	270 132
90	1	W. W.	O. K....	1—	—	.745	57.9	122 50	194 90	246 119	329 165	363 184	246 119
98	1	W. W.	Good....	1—	—	.736	60.2	118 48	198 92	244 118	327 164	376 191	248 120
124	1	W. W.	O. K....	2.0	—	.749	56.9	126 52	210 99	257 125	356 180	406 208	264 129
127	1	W. W.	O. K....	1.0	±	.747	57.4	124 51	208 98	257 125	352 178	405 207	261 127
128	1	W. W.	O. K....	1.0	±	.748	57.2	117 47	201 94	253 123	345 174	399 204	255 124
189	1	W. W.	O. K....	1—	—	.738	59.7	122 50	199 93	248 120	331 166	379 193	250 121
213	1	W. W.	O. K....	1—	—	.745	57.9	120 54	217 103	252 122	338 170	390 199	262 128
221	1	W. W.	O. K....	1—	—	.752	56.2	126 52	207 97	255 124	365 185	457 236	270 132
230	1	W. W.	O. K....	1—	—	.740	59.2	111 44	198 92	261 127	345 174	406 208	261 127
231	1	B. T..	O. K....	1—	—	.749	56.9	122 50	216 102	262 128	338 170	396 202	262 128

¹ W. W., "water white"; Y., "yellowish"; Y. T., "yellow tint"; S. Y., "slightly yellow"; B. T., "blue tint".² For each sample, the upper line of figures are in degrees Fahrenheit and the lower line in degrees centigrade.

TABLE 18.—Data on tests of gasoline collected in the 1917 survey, arranged to show refining practice of different companies—Continued.

LARGE REFINERS AND MARKETERS—Continued.

Sample No.	Company No.	Color.	Odor.	Unsaturation (per cent).	Doctor test.	Gravity.		Distillation.					
						Specific gravity.	Degrees Baumé.	Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	Average boiling point.
6	2	W. W.	O. K....	1—	—	0.739	59.4	{ 118 48	198 92	232 111	329 165	401 205	246 119
56	2	W. W.	O. K....	1—	—	.737	60.0	{ 126 52	205 96	246 119	329 165	405 207	253 123
59	2	W. W.	O. K....	1—	—	.736	60.2	{ 117 47	208 98	248 120	334 168	401 205	255 124
64	2	W. W.	O. K....	1—	—	.739	59.4	{ 122 50	207 97	250 121	333 167	401 205	255 124
74	2	W. W.	O. K....	1—	—	.740	59.2	{ 127 53	198 92	244 118	327 164	383 195	248 120
84	2	W. W.	O. K....	1—	—	.741	58.9	{ 124 51	194 90	244 118	334 168	387 197	248 120
87	2	B. T..	(3).....	2.0	—	.744	58.2	{ 124 51	203 95	246 119	334 168	396 202	253 123
198	2	W. W.	Good....	1—	±	.720	64.4	{ 117 47	194 90	239 115	334 168	399 204	246 119
201	2	W. W.	Good....	1—	±	.725	63.1	{ 122 50	199 93	239 115	324 162	397 203	246 119
214	2	W. W.	O. K....	1—	—	.738	59.7	{ 117 47	199 93	243 117	336 169	401 205	252 122
224	2	W. W.	O. K....	1—	±	.741	58.9	{ 104 40	201 94	252 122	345 174	399 204	255 124
229	2	W. W.	O. K....	1—	±	.739	59.4	{ 120 49	207 97	244 118	327 164	394 201	252 122
234	2	W. W.	O. K....	1—	±	.740	59.2	{ 131 55	208 98	257 125	327 164	396 202	259 126
206	2	W. W.	O. K....	1—	—	.734	60.7	{ 115 46	194 90	239 115	329 165	394 201	243 117
50	3	W. W.	O. K....	5.0	—	.746	57.7	{ 102 39	214 101	279 137	367 186	415 213	273 134
52	3	W. W.	O. K....	5.0	—	.746	57.7	{ 104 40	214 101	279 137	367 186	419 215	273 134
91	3	W. W.	(4).....	6.0	—	.748	57.2	{ 108 42	217 103	261 127	356 180	415 213	270 132
97	3	S. Y...	Good....	3.5	±	.749	56.9	{ 102 39	212 100	297 147	410 210	464 240	291 144
109	3	W. W.	(5).....	4.0	+	.744	58.2	{ 100 38	208 98	280 138	392 200	437 225	279 137
32	4	W. W.	O. K....	1—	+	.737	60.0	{ 133 56	208 98	257 125	352 178	412 211	262 128
37	4	W. W.	O. K....	1—	+	.739	59.4	{ 124 51	205 96	253 123	349 176	410 210	261 127
116	4	W. W.	O. K....	1—	±	.742	58.7	{ 158 70	208 98	239 115	313 156	369 187	248 120
69	5	W. W.	O. K....	1—	+	.741	58.9	{ 111 44	185 85	243 117	329 165	365 185	239 115
73	5	W. W.	O. K....	4.0	+	.746	57.7	{ 129 54	216 102	264 129	336 169	385 196	262 128

3 Like kerosene.

4 Aromatic.

5 Like "cracked" distillate.

TABLE 18.—Data on tests of gasoline collected in the 1917 survey, arranged to show refining practice of different companies—Continued.

LARGE REFINERS AND MARKETERS—Continued.

Sample No.	Company No.	Color.	Odor.	Unsaturation (per cent.)	Doctor test.	Gravity.		Distillation.					
						Specific gravity.	Degrees Baumé.	Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	Average boiling point.
78	5	W. W.	O. K....	4.0	—	0.739	59.4	{ 124 51	{ 198 92	{ 243 117	{ 316 158	{ 356 180	{ 243 117
79	5	W. W.	O. K....	1—	—	.740	59.2	{ 142 61	{ 221 105	{ 252 122	{ 316 158	{ 363 184	{ 255 124
82	5	W. W.	O. K....	6.0	+	.738	59.7	{ 108 42	{ 190 88	{ 248 120	{ 329 165	{ 374 190	{ 244 118
85	5	W. W.	O. K....	6.0	+	.742	58.7	{ 118 48	{ 194 90	{ 250 121	{ 329 165	{ 383 195	{ 250 121
89	5	Y. T..	O. K....	2.0	+	.737	60.0	{ 120 49	{ 203 95	{ 253 123	{ 334 165	{ 388 198	{ 253 123
135	5	W. W.	O. K....	3.0	+	.743	58.4	{ 131 55	{ 208 98	{ 253 123	{ 333 167	{ 383 195	{ 257 125
139	5	W. W.	O. K....	1—	—	.732	61.3	{ 140 (6)	{ 207 97	{ 241 116	{ 306 152	{ 365 185	{ 244 118
5	6	W. W.	O. K....	1—	±	.744	58.2	{ 108 42	{ 210 99	{ 277 136	{ 363 184	{ 421 216	{ 271 133
8	6	W. W.	O. K....	1—	—	.743	58.4	{ 104 49	{ 210 99	{ 275 135	{ 361 183	{ 419 215	{ 271 133
44	6	W. W.	O. K....	1—	+	.743	58.4	{ 122 50	{ 207 97	{ 252 122	{ 358 181	{ 435 224	{ 264 129
67	6	W. W.	O. K....	1—	—	.741	58.9	{ 118 48	{ 216 102	{ 277 136	{ 365 185	{ 419 215	{ 275 135
205	6	W. W.	O. K....	1—	+	.743	58.4	{ 118 48	{ 201 94	{ 250 121	{ 345 174	{ 410 210	{ 257 125
209	6	Y. T..	O. K....	1—	—	.742	58.7	{ 122 50	{ 205 96	{ 252 122	{ 349 176	{ 405 207	{ 259 126
211	6	W. W.	O. K....	1—	+	.743	58.4	{ 122 50	{ 203 95	{ 250 121	{ 347 175	{ 419 215	{ 257 125
113	8	W. W.	Good....	1—	—	.738	59.7	{ 140 (6)	{ 203 95	{ 239 115	{ 325 163	{ 390 199	{ 248 120
115	8	W. W.	O. K....	1—	—	.744	58.2	{ 126 52	{ 208 98	{ 264 129	{ 356 180	{ 399 204	{ 264 129
172	8	W. W.	O. K....	1—	—	.737	60.0	{ 108 42	{ 183 84	{ 237 114	{ 340 171	{ 396 202	{ 244 118
99	9	W. W.	Good....	1—	—	.740	59.2	{ 126 52	{ 203 95	{ 252 122	{ 356 180	{ 435 224	{ 262 128
106	9	W. W.	Good....	1—	—	.722	63.9	{ 126 52	{ 183 84	{ 212 100	{ 289 143	{ 369 187	{ 223 106
101	9	W. W.	Good....	1—	—	.744	58.2	{ 133 55	{ 214 101	{ 257 125	{ 354 179	{ 430 221	{ 266 130
102	9	W. W.	Good....	1—	—	.712	66.6	{ 108 42	{ 162 72	{ 198 92	{ 280 138	{ 352 178	{ 207 97
182	9	W. W.	O. K....	1—	—	.743	58.4	{ 207 49	{ 257 97	{ 257 125	{ 365 185	{ 415 213	{ 264 129
217	9	W. W.	O. K....	1—	—	.748	57.2	{ 145 63	{ 212 100	{ 255 124	{ 354 179	{ 437 225	{ 268 131
220	9	W. W.	O. K....	1—	—	.751	56.4	{ 122 50	{ 207 97	{ 253 123	{ 372 189	{ 460 238	{ 270 132

TABLE 18.—Data on tests of gasoline collected in the 1917 survey, arranged to show refining practice of different companies—Continued.

LARGE REFINERS AND MARKETERS—Continued.

Sample No.	Company No.	Color.	Odor.	Unsaturation (per cent).	Doctor test.	Gravity.			Distillation.				
						Specific gravity.	Degrees Baumé.	Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	Average boiling point.
228	9	W. W.	O. K.	1—	—	.742	58.7	{ 133 56	210 99	253 123	338 170	397 203	250 126
235	9	W. W.	O. K.	1—	—	.740	59.2	{ 124 51	214 101	259 126	347 175	403 206	264 129
31	10	W. W.	O. K.	3.0	+	.743	58.4	{ 120 49	201 94	257 125	367 186	417 214	264 129
34	10	W. W.	O. K.	1—	+	.705	68.6	{ 100 38	149 65	190 88	280 138	333 167	199 93
35	10	W. W.	O. K.	2.5	+	.741	58.9	{ 117 47	194 90	252 122	354 179	412 211	257 125
39	10	S. Y. ... ⁽³⁾		3.0	+	.744	58.2	{ 129 54	208 98	261 127	365 185	421 216	296 130
41	10	W. W.	O. K.	2.0	—	.751	56.4	{ 133 56	198 92	266 130	369 187	414 212	270 132
120	10	W. W.	O. K.	1.0	±	.747	57.4	{ 124 51	203 95	253 123	351 177	405 207	259 126
121	10	W. W.	O. K.	1.0	±	.734	60.7	{ 117 47	176 80	216 102	316 158	381 194	228 109
125	10	W. W.	O. K.	1.0	±	.747	57.4	{ 124 51	194 90	246 119	347 175	399 204	253 123
129	10	W. W.	O. K.	5.0	±	.747	57.4	{ 124 51	203 95	253 123	347 175	399 204	259 126
130	10	W. W.	O. K.	2.0	±	.748	57.2	{ 117 47	199 93	257 125	351 177	405 207	239 126
238	10	W. W.	O. K.	1—	—	.758	54.7	{ 140 60	207 97	235 113	302 150	363 184	213 117
239	10	W. W.	O. K.	3.0	±	.751	56.4	{ 135 57	208 98	253 123	347 175	403 206	251 127
240	10	W. W.	(⁽²⁾).....	5.0	—	.751	56.4	{ 109 43	212 100	275 135	363 184	406 208	271 125
241	10	W. W.	O. K.	3.0	±	.750	56.7	{ 122 50	207 97	266 130	374 190	430 221	271 133
242	10	W. W.	O. K.	3.0	±	.751	56.4	{ 118 48	207 97	255 124	347 175	398 209	261 127
243	10	W. W.	(⁽²⁾).....	6.0	—	.750	56.7	{ 113 45	203 95	275 135	365 185	410 210	270 132
244	10	W. W.	O. K.	1—	±	.759	54.5	{ 140 60	208 98	235 113	302 150	363 184	244 118
250	10	W. W.	O. K.	1—	—	.754	55.7	{ 129 54	194 90	226 108	289 143	351 166	228 109
58	12	W. W.	O. K.	1—	±	.736	60.2	{ 109 43	194 90	257 125	363 184	433 223	261 127
61	12	W. W.	O. K.	1—	±	.739	59.4	{ 117 47	199 93	257 125	369 187	424 218	264 129
1	12	W. W.	(⁽²⁾).....	3.0	±	.745	57.9	{ 117 47	212 100	259 126	347 175	424 218	261 127
9	12	W. W.	O. K.	3.0	—	.745	57.9	{ 115 46	212 100	257 125	334 168	396 202	257 125

³ Like kerosene.

⁵ Like "cracked" distillate.

TABLE 18. —Data on tests of gasoline collected in the 1917 survey, arranged to show refining practice of different companies—Continued.

LARGE REFINERS AND MARKETERS—Continued.

Sample No.	Company No.	Color.	Odor.	Unsaturation (per cent.).	Doctor test.	Gravity.		Distillation.					
						Specific gravity.	Degrees Baumé.	Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	Average boiling point.
15	13	W. W.	Good....	1—	—	0.747	57.4	{ 122 50	{ 185 85	{ 212 100	{ 266 130	{ 315 157	{ 199 93
18	13	W. W.	Good....	1—	—	.751	56.4	{ 126 52	{ 199 88	{ 217 103	{ 280 138	{ 342 172	{ 223 106
21	13	W. W.	Good....	1—	—	.740	59.2	{ 104 40	{ 187 86	{ 221 105	{ 280 138	{ 333 167	{ 221 105
131	13	Y. T.	O. K....	1—	—	.750	56.7	{ 122 50	{ 194 90	{ 237 114	{ 324 162	{ 383 195	{ 243 117
132	13	W. W.	O. K....	1—	±	.752	56.2	{ 122 50	{ 192 89	{ 235 113	{ 318 159	{ 374 190	{ 241 116
133	13	W. W.	Good....	1—	—	.785	48.3	{ 189 87	{ 252 122	{ 277 136	{ 338 170	{ 388 198	{ 282 139
134	15	W. W.	O. K....	1—	—	.748	57.2	{ 138 ^s 59	{ 189 87	{ 212 100	{ 270 132	{ 329 165	{ 219 104
17	14	W. W.	Good....	1—	—	.740	59.2	{ 113 45	{ 187 86	{ 226 108	{ 311 155	{ 374 190	{ 234 112
28	14	W. W.	Good....	1—	—	.744	58.2	{ 104 40	{ 181 83	{ 225 107	{ 293 145	{ 345 174	{ 225 107
12	15	W. W.	O. K....	1—	±	.747	57.4	{ 104 40	{ 198 ^s 92	{ 248 120	{ 324 162	{ 394 201	{ 248 120
190	15	W. W.	O. K....	1—	—	.737	60.0	{ 122 50	{ 201 94	{ 237 114	{ 311 155	{ 363 184	{ 241 116
215	15	W. W.	O. K....	1—	±	.738	59.7	{ 126 49	{ 205 96	{ 250 121	{ 338 170	{ 399 204	{ 255 124
223	15	W. W.	O. K....	1—	—	.737	60.0	{ 120 49	{ 198 ^s 92	{ 243 117	{ 331 166	{ 394 201	{ 248 120
227	15	W. W.	O. K....	1—	—	.743	58.4	{ 117 47	{ 203 95	{ 261 127	{ 338 170	{ 399 204	{ 259 126
232	15	W. W.	O. K....	1—	—	.744	58.2	{ 129 54	{ 208 98	{ 252 122	{ 324 162	{ 388 198	{ 253 123
13	16	W. W.	Good....	1—	—	.751	56.4	{ 124 51	{ 201 94	{ 230 110	{ 289 143	{ 338 170	{ 234 112
20	16	W. W.	Good....	1—	—	.751	56.4	{ 115 46	{ 198 ^s 92	{ 230 110	{ 289 143	{ 333 167	{ 230 110
62	17	W. W.	O. K....	1—	±	.737	60.0	{ 126 52	{ 216 102	{ 250 121	{ 313 156	{ 369 187	{ 252 122
208	17	W. W.	O. K....	1—	—	.739	57.4	{ 131 55	{ 228 109	{ 252 122	{ 322 161	{ 358 181	{ 252 122
192	18	W. W.	Good....	1—	±	.723	63.6	{ 120 49	{ 190 88	{ 241 116	{ 342 172	{ 396 202	{ 248 120
193	18	W. W.	Good....	1—	±	.686	74.1	{ 91 33	{ 140 60	{ 178 81	{ 255 124	{ 313 156	{ 185 85
202	18	W. W.	Good....	.....	.....	.729	62.0	{ 153 67	{ 205 96	{ 248 120	{ 333 167	{ 408 209	{ 257 125
16	19	W. W.	Good....	1—	—	.748	57.2	{ 120 49	{ 180 82	{ 207 97	{ 270 132	{ 331 166	{ 214 101
19	19	W. W.	Good....	1—	—	.748	57.2	{ 118 48	{ 181 83	{ 208 98	{ 270 132	{ 331 166	{ 214 101

^sLike kerosene.

TABLE 18.—Data on tests of gasoline collected in the 1917 survey, arranged to show refining practice of different companies—Continued.

LARGE REFINERS AND MARKETERS—Continued.

Sample No.	Company No.	Color.	Odor.	Unsaturation (per cent.).	Doctor test.	Gravity.		Distillation.					
						Specific gravity.	Degrees Baumé.	Initial boiling point.	20 per cent. mark.	50 per cent. mark.	90 per cent. mark.	Dry point.	Average boiling point.
81	21	W. W.	O. K....	3.0	—	0.735	60.5	{ 106 41	{ 183 84	{ 239 115	{ 327 161	{ 365 185	{ 239 115
143	22	W. W.	O. K....	1—	—	.744	58.2	{ 111 44	{ 194 90	{ 273 134	{ 383 195	{ 414 212	{ 270 132
150	22	B. T..	O. K....	1.5	±	.741	58.9	{ 129 54	{ 203 95	{ 252 122	{ 336 169	{ 388 198	{ 255 124
154	22	W. W.	O. K....	3.0	±	.742	58.7	{ 104 40	{ 192 89	{ 279 137	{ 387 197	{ 424 218	{ 273 134
171	22	W. W.	(°)	3.0	—	.742	58.7	{ 102 39	{ 194 90	{ 279 137	{ 392 200	{ 430 221	{ 275 135

SMALL REFINERS.

96	24	Y. T.	(°)	10.0	—	0.780	49.5	{ 178 81	{ 266 130	{ 307 153	{ 367 186	{ 406 208	{ 304 151
144	29	W. W.	O. K....	3.0	—	.751	56.4	{ 131 55	{ 212 100	{ 257 125	{ 349 176	{ 432 222	{ 266 130
180	31	W. W.	O. K....	1—	±	.742	58.7	{ 122 50	{ 187 86	{ 210 99	{ 266 130	{ 320 160	{ 214 101
181	31	W. W.	O. K....	1—	±	.742	58.7	{ 135 57	{ 187 86	{ 212 100	{ 268 131	{ 322 161	{ 217 103
178	32	W. W.	O. K....	1—	—	.746	57.7	{ 122 50	{ 210 99	{ 250 121	{ 329 165	{ 396 202	{ 255 124
179	32	W. W.	O. K....	1—	±	.736	60.2	{ 122 50	{ 194 90	{ 230 110	{ 313 156	{ 372 189	{ 239 115
184	32	Y.....	O. K....	1—	—	.736	60.2	{ 120 49	{ 194 90	{ 241 116	{ 322 161	{ 381 194	{ 243 117
191	32	W. W.	O. K....	1—	—	.707	68.0	{ 104 40	{ 153 67	{ 189 87	{ 261 127	{ 334 168	{ 198 92
149	32	W. W.	O. K....	3.0	±	.736	60.2	{ 136 58	{ 201 94	{ 237 114	{ 315 157	{ 374 190	{ 244 118
183	33	W. W.	Good....	1—	—	.732	61.3	{ 118 48	{ 194 90	{ 239 115	{ 322 161	{ 379 193	{ 243 117
177	39	W. W.	O. K....	1—	—	.728	62.3	{ 131 55	{ 194 90	{ 241 116	{ 360 182	{ 437 225	{ 257 125
2	40	W. W.	O. K....	1—	—	.740	59.2	{ 118 48	{ 190 88	{ 230 110	{ 318 159	{ 379 193	{ 239 115
111	41	W. W.	Good....	1—	—	.742	58.7	{ 167 75	{ 223 106	{ 253 123	{ 322 161	{ 378 192	{ 261 127
212	42	W. W.	O. K....	1—	—	.749	56.9	{ 126 52	{ 198 92	{ 241 116	{ 331 166	{ 387 197	{ 248 120
237	43	W. W.	O. K....	1—	—	.746	57.7	{ 138 59	{ 217 103	{ 255 124	{ 316 158	{ 370 188	{ 255 124
117	45	W. W.	O. K....	1—	—	.749	56.9	{ 144 62	{ 217 103	{ 266 130	{ 360 182	{ 424 218	{ 273 134
48	46	W. W.	O. K....	1—	±	.742	58.7	{ 149 65	{ 216 102	{ 253 123	{ 338 170	{ 408 209	{ 262 128

° Like "cracked" distillate.

TABLE 18.—*Data on tests of gasoline collected in the 1917 survey, arranged to show refining practice of different companies—Continued.*

SMALL REFINERS—Continued.

Sample No.	Company No.	Color.	Odor.	Unsaturation, per cent.	Doctor test.	Gravity.		Distillation.					
						Specific gravity.	Degrees Baumé.	Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	Average boiling point.
210	50	W. W.	O. K....	1—	±	.743	58.4	{ 106 41	{ 205 96	{ 257 125	{ 385 196	{ 457 236	{ 266 130
75	51	W. W.	Good....	1—	—	.745	57.9	{ 140 60	{ 217 103	{ 264 129	{ 338 170	{ 381 194	{ 264 129
114	52	W. W.	Good....	1—	+	.743	58.4	{ 140 60	{ 208 98	{ 248 120	{ 343 173	{ 417 214	{ 261 127
45	54	S. Y.	O. K....	1—	+	.738	59.7	{ 109 43	{ 201 94	{ 261 127	{ 369 187	{ 410 210	{ 264 129
54	54	S. Y.	O. K....	1—	+	.739	59.4	{ 118 48	{ 201 94	{ 264 129	{ 383 195	{ 455 235	{ 273 134
63	58	W. W.	O. K....	1—	—	.735	60.5	{ 127 53	{ 221 105	{ 279 137	{ 378 192	{ 437 225	{ 280 138
77	60	W. W.	O. K....	4.0	+	.737	60.0	{ 124 51	{ 212 100	{ 257 125	{ 320 160	{ 365 185	{ 253 123
194	61	W. W.	Good....	1—	±	.691	72.6	{ 86 30	{ 144 62	{ 194 90	{ 327 164	{ 394 201	{ 210 99
198	63	V. T.	Good....	1—	+	.742	58.7	{ 127 53	{ 207 97	{ 252 122	{ 352 178	{ 426 219	{ 262 128
216	64	W. W.	O. K....	1—	+	.751	56.4	{ 136 58	{ 208 98	{ 246 119	{ 318 159	{ 363 184	{ 250 121
185	65	W. W.	O. K....	1—	±	.742	58.7	{ 131 55	{ 212 100	{ 259 126	{ 338 170	{ 387 197	{ 261 127
158	67	W. W.	O. K....	1—	±	.736	60.2	{ 127 53	{ 208 98	{ 259 126	{ 349 176	{ 401 205	{ 262 128
80	68	W. W.	O. K....	1—	—	.739	59.4	{ 140 60	{ 216 102	{ 262 128	{ 347 175	{ 399 204	{ 266 130
186	69	W. W.	O. K....	1—	—	.734	60.7	{ 133 56	{ 203 95	{ 234 112	{ 304 151	{ 360 182	{ 241 116
14	70	W. W.	Good....	1—	—	.739	59.4	{ 90 32	{ 189 87	{ 239 115	{ 325 163	{ 379 193	{ 239 115
25	70	W. W.	Good....	1—	±	.772	51.3	{ 100 38	{ 244 118	{ 291 144	{ 381 194	{ 448 231	{ 291 144
26	70	W. W.	Good....	1—	±	.720	64.4	{ 95 35	{ 149 65	{ 217 103	{ 333 167	{ 385 196	{ 223 106
20	70	W. W.	Good....	1—	—	.722	63.9	{ 88 31	{ 158 70	{ 212 100	{ 311 155	{ 370 188	{ 217 103
225	71	W. W.	O. K....	1—	—	.742	58.7	{ 120 49	{ 194 90	{ 232 111	{ 309 154	{ 363 184	{ 237 114
226	71	W. W.	O. K....	1—	—	.765	53.0	{ 167 75	{ 243 117	{ 273 134	{ 338 170	{ 392 200	{ 277 136
24	72	W. W.	Good....	1—	±	.740	59.2	{ 104 40	{ 176 80	{ 217 103	{ 288 142	{ 347 175	{ 219 104
22	74	W. W.	Good....	1—	—	.740	59.2	{ 95 35	{ 171 77	{ 223 106	{ 295 146	{ 342 172	{ 219 104
7	75	W. W.	O. K....	1—	—	.738	59.7	{ 127 53	{ 208 98	{ 246 119	{ 324 162	{ 385 196	{ 252 122
4	75	W. W.	O. K....	1—	—	.737	60.0	{ 124 51	{ 207 97	{ 246 119	{ 320 160	{ 383 195	{ 250 121

³ Like kerosene.

TABLE 18.—Data on tests of gasoline collected in the 1917 survey, arranged to show refining practice of different companies—Continued.

SMALL REFINERS—Continued.

Sample No.	Company No.	Color.	Odor.	Unsaturation (per cent).	Doctor test.	Gravity.		Distillation.					
						Specific gravity.	Degrees Baumé.	Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	Average boiling point.
188	79	W. W.	O. K....	1—	±	0.732	61.3	{ 122 50	{ 189 87	{ 230 110	{ 322 161	{ 383 195	{ 239 115
71	83	W. W.	O. K....	1—	—	.737	60.0	{ 140 60	{ 208 98	{ 243 117	{ 313 156	{ 357 186	{ 246 119
72	83	W. W.	O. K....	1—	—	.737	60.0	{ 129 54	{ 210 99	{ 246 119	{ 311 155	{ 365 185	{ 248 120
23	84	W. W.	Good....	1—	—	.728	62.3	{ 100 38	{ 174 79	{ 216 102	{ 288 142	{ 340 171	{ 217 103
145	86	W. W.	O. K....	1—	±	.770	51.8	{ 162 72	{ 235 113	{ 261 127	{ 327 164	{ 383 195	{ 268 131
222	90	W. W.	O. K....	1—	±	.735	60.5	{ 124 51	{ 198 92	{ 235 113	{ 318 159	{ 367 186	{ 241 116
159	91	W. W.	O. K....	1—	—	.724	63.4	{ 126 52	{ 198 92	{ 232 111	{ 302 150	{ 358 181	{ 237 118
27	92	W. W.	Good....	1—	—	.750	56.7	{ 108 42	{ 194 90	{ 232 111	{ 293 145	{ 343 173	{ 230 110

JOBBERS.

30	97	W. W.	O. K....	1—	—	0.743	58.4	{ 133 56	{ 210 99	{ 259 126	{ 354 179	{ 405 207	{ 264 129
119	98	W. W.	O. K....	1—	±	.748	57.2	{ 117 47	{ 196 91	{ 248 120	{ 347 175	{ 397 203	{ 253 123
105	99	W. W.	Good....	1—	—	.736	60.2	{ 99 37	{ 187 86	{ 261 127	{ 378 192	{ 446 230	{ 264 129
245	100	W. W.	O. K....	1—	—	.748	57.2	{ 111 44	{ 190 88	{ 232 111	{ 313 156	{ 381 194	{ 237 114
246	100	W. W.	O. K....	1—	—	.751	56.4	{ 127 53	{ 199 93	{ 232 111	{ 297 147	{ 354 179	{ 235 113
249	100	W. W.	O. K....	1—	—	.750	56.7	{ 124 51	{ 189 87	{ 228 109	{ 302 150	{ 361 185	{ 234 112
251	100	W. W.	O. K....	1—	—	.755	55.4	{ 144 62	{ 198 92	{ 226 108	{ 291 144	{ 349 171	{ 234 112
252	100	W. W.	O. K....	1—	—	.756	55.2	{ 133 56	{ 194 90	{ 226 108	{ 289 143	{ 329 165	{ 230 110
255	100	W. W.	O. K....	1—	—	.751	56.4	{ 133 56	{ 194 90	{ 232 111	{ 307 153	{ 370 188	{ 239 115
236	102	W. W.	O. K....	1—	—	.733	61.0	{ 129 54	{ 189 87	{ 223 106	{ 298 148	{ 365 185	{ 230 110
147	106	Y. T..	O. K....	4.0	+	.744	58.2	{ 147 64	{ 214 101	{ 259 126	{ 342 172	{ 399 204	{ 244 120
60	108	W. W.	O. K....	1—	—	.742	58.7	{ 104 40	{ 216 102	{ 307 153	{ 406 208	{ 446 230	{ 245 116
94	112	W. W.	O. K....	1—	—	.744	58.2	{ 131 55	{ 203 95	{ 250 121	{ 333 167	{ 397 203	{ 255 124
140	112	W. W.	Good....	1—	+	.743	58.4	{ 126 52	{ 210 99	{ 262 128	{ 365 185	{ 439 226	{ 270 132
176	113	W. W.	O. K....	1—	—	.745	57.9	{ 113 45	{ 199 93	{ 264 129	{ 360 199	{ 432 250	{ 273 134

TABLE 18.—*Data on tests of gasoline collected in the 1917 survey, arranged to show refining practice of different companies—Continued.*

JOBBERs—Continued.

Sample No.	Company No.	Color.	Odor.	Unsaturation (per cent).	Doctor test.	Gravity.		Distillation.					
						Specific gravity.	Degrees Baumé.	Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	Average boiling point.
155	113	W. W.	O. K....	1—	±	.740	59.2	{ 131 55	{ 203 95	{ 246 119	{ 338 170	{ 406 208	{ 255 124
95	117	W. W.	O. K....	1—	—	.742	58.7	{ 136 58	{ 210 99	{ 248 120	{ 333 167	{ 401 205	{ 257 125
200	119	W. W.	Good....	3.0	±	.742	63.4	{ 90 32	{ 194 90	{ 266 130	{ 370 188	{ 401 205	{ 264 129
247	121	W. W.	O. K....	1—	—	.756	55.2	{ 131 55	{ 190 88	{ 225 107	{ 293 145	{ 343 173	{ 230 110
248	121	W. W.	O. K....	1—	—	.755	55.4	{ 129 54	{ 196 91	{ 226 108	{ 286 141	{ 338 170	{ 230 110
253	121	W. W.	O. K....	1—	—	.755	55.4	{ 135 57	{ 205 96	{ 235 113	{ 304 151	{ 351 177	{ 241 116
254	121	W. W.	O. K....	1—	—	.757	54.9	{ 135 57	{ 196 91	{ 228 109	{ 289 143	{ 331 166	{ 232 111
93	125	W. W.	O. K....	1—	—	.738	59.7	{ 154 68	{ 221 105	{ 252 122	{ 343 173	{ 419 215	{ 266 130
197	132	W. W.	Good....	4.0	—	.708	67.7	{ 79 26	{ 158 70	{ 248 120	{ 356 180	{ 372 189	{ 237 114
110	134	W. W.	Good....	1—	—	.744	58.2	{ 122 50	{ 199 93	{ 243 117	{ 385 196	{ 453 234	{ 266 130
106	136	W. W.	.....	3.0	±	.752	56.2	{ 117 47	{ 221 105	{ 286 141	{ 392 200	{ 459 237	{ 288 142
38	141	W. W.	O. K....	1—	±	.742	58.7	{ 104 40	{ 201 94	{ 280 138	{ 417 214	{ 487 253	{ 288 142
146	141	W. W.	O. K....	2.0	+	.746	57.7	{ 149 65	{ 228 109	{ 273 134	{ 354 179	{ 423 217	{ 279 137
218	141	W. W.	Good....	1—	—	.735	60.5	{ 95 35	{ 165 74	{ 253 123	{ 355 180	{ 410 210	{ 248 120
219	141	W. W.	Good....	1—	—	.753	55.9	{ 118 48	{ 203 107	{ 264 129	{ 338 170	{ 383 195	{ 261 127
92	142	W. W.	O. K....	1—	—	.749	56.9	{ 118 48	{ 217 103	{ 262 128	{ 372 189	{ 448 231	{ 273 134
115	152	N. T..	Good....	1—	—	.689	73.2	{ 86 30	{ 127 53	{ 172 78	{ 295 146	{ 338 179	{ 187 86
78	154	W. W.	O. K....	4.0	±	.737	60.0	{ 115 46	{ 196 91	{ 244 118	{ 313 155	{ 361 183	{ 243 117
55	157	W. W.	O. K....	1—	—	.742	58.7	{ 86 30	{ 214 118	{ 320 160	{ 446 230	{ 482 250	{ 331 166
151	158	W. W.	O. K....	1—	—	.738	59.7	{ 126 52	{ 205 96	{ 250 121	{ 340 171	{ 419 215	{ 257 125
233	161	W. W.	O. K....	1—	—	.751	56.4	{ 129 54	{ 212 100	{ 268 131	{ 379 193	{ 450 232	{ 277 136
136	163	W. W.	O. K....	1—	—	.736	60.2	{ 138 59	{ 208 98	{ 255 124	{ 334 168	{ 376 191	{ 257 125
195	168	W. W.	Good....	1—	±	.725	63.1	{ 122 50	{ 199 93	{ 234 112	{ 309 154	{ 376 191	{ 241 116
196	168	W. W.	Good....	1—	±	.730	61.8	{ 147 64	{ 207 97	{ 237 114	{ 325 163	{ 388 198	{ 252 122

* Like "cracked" distillate.

TABLE 18.—Data on tests of gasoline collected in the 1917 survey, arranged to show refining practices of different companies—Continued.

JOBBERS—Continued.

Sample No.	Company No.	Color.	Color.	Unsaturation (per cent.).	Doctor test.	Gravity.		Distillation.					
						Specific gravity.	Degrees Baumé.	Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	Average boiling point.
68	172	W. W.	O. K....	1—	—	0.740	59.2	{ 131 55	{ 208 98	{ 253 123	{ 347 175	{ 424 218	{ 261 127
132	177	W. W.	O. K....	3.0	±	.740	59.2	{ 122 50	{ 212 100	{ 257 125	{ 333 167	{ 387 197	{ 259 126
107	181	W. W.	Good....	1—	+	.742	58.7	{ 104 40	{ 210 99	{ 257 125	{ 376 191	{ 453 234	{ 270 132
118	181	W. W.	O. K....	1—	+	.742	58.7	{ 115 46	{ 212 100	{ 259 126	{ 365 185	{ 442 228	{ 268 131
137	182	W. W.	O. K....	1—	—	.741	58.9	{ 129 54	{ 203 95	{ 244 118	{ 329 165	{ 390 199	{ 252 122
122	183	W. W.	O. K....	1—	±	.702	69.4	{ 118 48	{ 163 73	{ 196 91	{ 271 133	{ 374 190	{ 208 98
123	183	W. W.	O. K....	1.0	±	.748	57.2	{ 126 52	{ 199 93	{ 246 119	{ 352 178	{ 424 218	{ 257 125
126	183	W. W.	O. K....	1—	±	.747	57.4	{ 144 62	{ 266 108	{ 268 131	{ 360 182	{ 414 212	{ 275 135
160	184	W. W.	O. K....	1—	+	.747	57.4	{ 129 54	{ 214 101	{ 257 125	{ 347 175	{ 419 215	{ 264 129
170	184	W. W.	O. K....	1—	+	.722	63.9	{ 104 40	{ 171 77	{ 216 102	{ 306 152	{ 374 190	{ 223 106
156	184	W. W.	O. K....	1—	—	.741	58.9	{ 126 52	{ 216 102	{ 264 129	{ 363 184	{ 424 218	{ 271 133
157	184	W. W.	O. K....	1—	—	.713	66.4	{ 100 38	{ 160 71	{ 205 96	{ 298 148	{ 360 182	{ 214 101
65	188	W. W.	O. K....	1—	—	.734	60.7	{ 104 40	{ 207 97	{ 270 132	{ 379 193	{ 428 220	{ 275 135
153	189	W. W.	O. K....	1—	—	.739	59.4	{ 122 50	{ 207 97	{ 250 121	{ 340 171	{ 415 213	{ 259 126
174	190	W. W.	O. K....	1—	—	.745	57.9	{ 138 59	{ 217 103	{ 257 125	{ 329 165	{ 365 185	{ 259 126
175	190	W. W.	O. K....	1—	+	.735	60.5	{ 117 47	{ 217 103	{ 275 135	{ 379 193	{ 435 224	{ 279 137
142	196	W. W.	Good....	1—	+	.723	63.6	{ 111 44	{ 181 83	{ 223 106	{ 315 157	{ 405 207	{ 234 112
199	202	W. W.	Good....	1—	±	.726	62.8	{ 93 34	{ 162 72	{ 239 115	{ 334 168	{ 401 205	{ 237 114
203	202	W. W.	O. K....	1—	±	.731	61.5	{ 115 46	{ 194 90	{ 244 118	{ 324 162	{ 390 199	{ 246 119
204	202	W. W.	O. K....	1—	—	.684	74.7	{ 90 32	{ 120 49	{ 178 81	{ 315 157	{ 390 190	{ 199 93
46	211	W. W.	O. K....	1—	±	.730	61.8	{ 104 40	{ 192 89	{ 270 132	{ 343 173	{ 392 200	{ 259 126
51	211	W. W.	O. K....	1—	±	.728	62.3	{ 99 37	{ 181 83	{ 259 126	{ 358 181	{ 408 209	{ 255 124
53	211	W. W.	O. K....	1—	±	.730	61.8	{ 100 38	{ 183 84	{ 262 128	{ 354 179	{ 406 208	{ 257 125
103	215	W. W.	Good....	1—	—	.740	59.2	{ 133 56	{ 205 96	{ 241 116	{ 329 165	{ 401 205	{ 252 122

TABLE 18.—Data on tests of gasoline collected in the 1917 survey, arranged to show refining practice of different companies—Continued.

JOBBERs—Continued.

Sample No.	Company No.	Color.	Odor.	Unsaturation (per cent).	Doctor test.	Gravity.		Distillation.					
						Specific gravity.	Degrees Baumé.	Initial boiling point.	20 per cent mark.	50 per cent mark.	90 per cent mark.	Dry point.	Average boiling point.
104	215	W. W.	Good....	1—	—	0.731	61.5	{ 124 51	{ 190 88	{ 228 109	{ 315 157	{ 388 197	{ 237 114
83	216	W. W.	O. K....	1—	—	.741	58.9	{ 142 61	{ 210 99	{ 248 120	{ 325 163	{ 381 194	{ 253 123
173	224	Y. T..	().....	1—	+	.744	58.2	{ 140 60	{ 212 100	{ 252 122	{ 351 177	{ 397 203	{ 261 127
189	225	W. W.	O. K....	1—	—	.735	60.5	{ 126 52	{ 203 95	{ 232 111	{ 304 151	{ 356 180	{ 237 114
141	226	W. W.	Good....	1—	—	.735	60.5	{ 108 42	{ 189 87	{ 230 110	{ 316 158	{ 374 190	{ 235 113
57	228	W. W.	O. K....	1—	±	.738	59.7	{ 104 40	{ 221 105	{ 273 134	{ 367 186	{ 425 220	{ 273 134
207	235	W. W.	O. K....	1—	—	.745	57.9	{ 118 48	{ 203 95	{ 253 123	{ 374 190	{ 404 240	{ 268 131
138	237	Y. T..	().....	1—	±	.733	61.0	{ 127 53	{ 199 93	{ 239 115	{ 306 152	{ 352 178	{ 239 115
112	245	W. W.	Good....	1—	—	.740	59.2	{ 138 59	{ 207 97	{ 235 113	{ 297 147	{ 352 178	{ 241 116
15	248	W. W.	O. K....	1—	—	.743	58.4	{ 122 50	{ 190 88	{ 232 111	{ 320 160	{ 381 194	{ 241 116
187	250	W. W.	O. K....	1—	—	.737	60.0	{ 126 52	{ 199 93	{ 235 113	{ 313 156	{ 367 186	{ 243 117

³ Like kerosene.

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